Appendix D

Cost Estimation

Appendix D (Section D-1)

Cost Estimates of Remediation Modules

Appendix D-1 List of Tables

D-1. 19	Pit 7 Complex (Operable Unit 5)	Module G - Control migration of uranium-238 in ground water using an in situ reactive permeable barrier.
D-1. 20	Pit 7 Complex (Operable Unit 5)	Module H - Waste characterization with contingent monitoring or excavation of Landfill Pits 3 and 5.
D-1. 21	Building 850 (Operable Unit 5)	Module B - Monitoring of ground and surface water.
D-1. 22	Building 850 (Operable Unit 5)	Module C - Risk and Hazard Management.
D-1. 23	Building 850 (Operable Unit 5)	Module D - Monitored natural attenuation of tritium in ground water and surface water.
D-1. 24	Building 850 (Operable Unit 5)	Module E - Ground water extraction and treatment of uranium-238 and nitrate.
D-1. 25	Building 850 (Operable Unit 5)	Module F - Control migration of uranium-238 in ground water using an in situ reactive permeable
D-1. 26	Building 850 (Operable Unit 5)	Module G - Excavation of contaminated soil and bedrock underlying the Building 850 Firing Table, removal of the contamintated sandpile, and removal of contaminated soil adjacent to the firing table.
D-1. 27	Pit 2 (Operable Unit 5)	Module B - Monitoring of ground and surface water.
D-1. 28	Pit 2 (Operable Unit 5)	Module C - Waste characterization with contingent monitoring, capping, or excavation of Landfill Pit 2.
D-1. 29	Building 854 (Operable Unit 6)	Module B - Monitoring of ground and surface water.
D-1. 30	Building 854 (Operable Unit 6)	Module C - Risk and Hazard Management.
D-1. 31	Building 854 (Operable Unit 6)	Module D - Ground water and soil vapor extraction and treatment of VOCs and nitrate.
D-1. 32	Building 832 Canyon (Operable Unit 7)	Module B - Monitoring.
D-1. 33	Building 832 Canyon (Operable Unit 7)	Module C - Risk and Hazard Management.
D-1. 34	Building 832 Canyon (Operable Unit 7)	Module D - Ground water and soil vapor extraction and treatment of VOCs, perchlorate, and nitrate at Building 832.
D-1. 35	Building 832 Canyon (Operable Unit 7)	Module E - Ground water and soil vapor extraction and treatment of VOCs, perchlorate, and nitrate at Building 830.
D-1. 36	Building 832 Canyon (Operable Unit 7)	Module F - Downgradient ground water extraction using a siphon with ex situ treatment of VOCs by iron filings.
D-1. 37	Building 801 and Landfill Pit 8 (Operating Unit 8)	Module B - Monitoring of ground water.
D-1. 38	Building 801 and Landfill Pit 8 (Operating Unit 8)	Module C - Waste characterization with contingent monitoring, capping, or excavation of Landfill Pit 8.

D-1. 39	Building 833 (Operating Unit 8)	Module B - Monitoring of ground water.
D-1. 40	Building 833 (Operating Unit 8)	Module C - Risk and Hazard Management.
D-1. 41	Building 833 (Operating Unit 8)	Module D - Ground water and soil vapor extraction and treatment of VOCs.
D-1. 42	Building 845 Firing Table and Landfill Pit 9 (Operating Unit 9)	Module B - Monitoring of ground and surface water.
D-1. 43	Building 845 Firing Table and Landfill Pit 9 (Operating Unit 9)	Module C - Waste characterization with contingent monitoring, capping, or excavation of Landfill Pit 9.
D-1. 44	Building 851 Firing Table (Operating Unit 8)	Module B - Monitoring of ground and surface water.
D-1. 45	Building 851 Firing Table (Operating Unit 8)	Module C - Ground water extraction and treatment of uranium-238.

Building 834 (Operable Unit 2)

Table D-1.1. Module B - Monitoring of ground water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured monthly	47	ea			3,807
Water quality sampling / analysis	Wells sampled quarterly	47	ea			118,346
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	47	ea			6,251
Subtotal costs				**0**	**0**	**146,804**
Total costs				**0**	**0**	**146,804**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$2,257,000**
Total present worth costs	**$2,257,000**

[a] **O&M assumes 30 years of monitoring.**

Building 834 (Operable Unit 2)

Table D-1.2. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample ambient air (VOCs)	Location	2	ea			2,898
Conduct wildlife survey	Survey	2	ea			3,297
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**13,154**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**13,887**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$213,000**
Total present worth costs	**$231,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Building 834 (Operable Unit 2)

Table D-1.3. Module D - Ground water and soil vapor extraction and treatment of VOCs, TBOS/TKEBS and nitrate.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water and SVE Wellfield						
Drilling preparation	New wells	1	ea	2,614		
Drilling	New wells	1	ea	4,051		
Drilling footage	Avg. depth of wells	30	ft	5,280		
Well design and construction	New wells	1	ea	8,645		
Hydraulic testing	Pump tests	8	ea		101,040	
Soil vapor testing	SVE tests	4	ea		48,116	
Subtotal costs				**20,590**	**149,156**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,070	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Modify B834 SVE System	Treatment systems	1	ea	145,158		
Add-on bioreactor to existing facility	GWTU-BIO	1	ea	70,871		
Construct pipeline	Length of pipeline	1,400	ft	221,200		
Hook up wells	Wells	8	ea	160,816		
Subtotal costs				**598,045**	**36,800**	**0**
O&M - B834-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			79,888
Mechanical O&M (GWTU)	Treatment systems	1	ea			134,333
Facility documentation and data collection	Treatment systems	1	ea			181,500
Extraction well sampling & analysis	Treatment systems	1	ea			105,248
Remedial system permit report	Treatment systems	1	ea			46,800
Dispose of GW GAC canisters (1,000 lb)	Canisters	0.2	ea			778
Dispose of SVE GAC canisters (2,000 lb)	Canisters	2	ea			6,300
Manage wellfield flow	Treatment systems	1	ea			20,868
Subtotal costs				**0**	**0**	**575,715**
Total costs				**618,635**	**185,956**	**575,715**

Cost summary

Capital costs	**$805,000**
Present worth of O&M costs[a]	**$8,802,000**
Total present worth costs	**$9,607,000**

[a] **O&M assumes 30 years of ground water extraction, and 10 years of soil vapor extraction.**

Building 834 (Operable Unit 2)

Table D-1.4. Module E - Enhanced in situ bioremediation of VOCs.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water Wellfield						
Drilling preparation	New wells	4	ea	10,456		
Drilling	New wells	4	ea	16,204		
Drilling footage	Avg. depth of wells	70	ft	49,280		
Well design and construction	New wells	4	ea	34,580		
Hydraulic testing	Pump tests	8	ea		101,040	
Subtotal costs				**110,520**	**101,040**	**0**
Design and Construct Remediation System						
Perform microorganism experiments	Labor	200	hr		18,400	
Remedial design report	Reports	1	ea		31,070	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Subtotal costs				**0**	**45,958**	**0**
Operate In Situ Bioremediation Wellfield						
Operate injection wellfield	Labor	1000	hr			60,000
Data analysis & representation	Labor	200	hr			18,400
Modeling	Labor	200	hr			18,400
Water quality sampling/analysis	Wells sampled quarterly	10	ea			50,370
Subtotal costs				**0**	**0**	**147,170**
Total costs				**0**	**146,998**	**147,170**

Cost summary

Capital costs	**$147,000**
Present worth of O&M costs[a]	**$2,262,000**
Total present worth costs	**$2,409,000**

[a] **O&M assumes 30 years of ground water treatment.**

Landfill Pit 6 (Operable Unit 3)

Table D-1.5. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	30	ea			2,430
Water quality sampling / analysis	Wells sampled quarterly	30	ea			75,540
Surface water quality sampling / analysis	Locations sampled quarterly	4	ea			9,716
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	30	ea			3,990
Subtotal costs				**0**	**0**	**110,076**
Total costs				**0**	**0**	**110,076**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$1,692,000**
Total present worth costs	**$1,692,000**

[a] **O&M assumes 30 years of monitoring.**

Landfill Pit 6 (Operable Unit 3)

Table D-1.6. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Inspect Spring 7 (in conjunction with quarterly ground water monitoring of Pit 6)	Event	4	ea			0
Sample ambient air (VOCs)	Location	1	ea			1,449
Conduct wildlife survey	Survey	2	ea			3,297
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**11,706**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**12,438**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$191,000**
Total present worth costs	**$209,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Landfill Pit 6 (Operable Unit 3)

Table D-1.7. Module D - Monitored natural attenuation of VOCs and tritium in ground water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring well installation						
Drilling preparation	New wells	2	ea	5,228		
Drilling	New wells	2	ea	8,102		
Drilling footage	Avg. depth of wells	150	ft	52,800		
Well design and construction	New wells	2	ea	17,290		
Hydraulic testing	Pump tests	2	ea		25,260	
Subtotal costs				**83,420**	**25,260**	**0**
Monitoring						
Water levels	Wells measured quarterly	2	ea			162
Water quality sampling / analysis	Wells sampled quarterly	2	ea			5,036
Pump maintenance or replacement	Wells	2	ea			266
Data analysis & representation	Labor	100	ea			9,200
Modeling	Labor	100	ea			9,200
Subtotal costs				**0**	**0**	**23,864**
Total costs				**83,420**	**25,260**	**23,864**

Cost summary

Capital costs	**$109,000**
Present worth of O&M costs[a]	**$367,000**
Total present worth costs	**$476,000**

[a] **O&M assumes 30 years of monitoring.**

Landfill Pit 6 (Operable Unit 3)

Table D-1.8. Module E - Ground water extraction and treatment of VOCs and perchlorate.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wellfield						
Drilling preparation	New wells	1	ea	2,614		
Drilling	New wells	1	ea	4,051		
Drilling footage	Avg. depth of wells	60	ft	10,560		
Well design and construction	New wells	1	ea	8,645		
Hydraulic testing	Pump tests	4	ea		50,520	
Subtotal costs				**25,870**	**50,520**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct P6-TF1	SWAT-GBI	1	ea	187,433		
Construct pipeline	Length of pipeline	660	ft	104,280		
Hookup wells	Wells	5	ea	20,102		
Subtotal costs				**361,815**	**77,029**	**0**
O & M - P6-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			83,632
Mechanical O & M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	5	ea			8,840
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters (200 lb)	Canisters	0.04	ea			12
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**229,158**
Total costs				**387,685**	**127,549**	**229,158**

Cost summary

Capital costs	**$515,000**
Present worth of O&M costs[a]	**$3,523,000**
Total present worth costs	**$4,038,000**

[a] **O&M assumes 30 years of ground water extraction.**

HE Process Area (Operable Unit 4)

Table D-1.9. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	70	ea			5,670
Water quality sampling/analysis	Wells sampled quarterly	70	ea			176,260
Surface water quality sampling/analysis	Locations sampled quarterly	2	ea			4,858
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	70	ea			9,310
Subtotal costs				**0**	**0**	**214,498**
Total costs				**0**	**0**	**214,498**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$3,297,000**
Total present worth costs	**$3,297,000**

[a] **O&M assumes 30 years of monitoring.**

HE Process Area (Operable Unit 4)

Table D-1.10. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample ambient air (VOCs)	Location	2	ea			2,898
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**9,858**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**10,590**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$163,000**
Total present worth costs	**$181,000**

[a] **O&M assumes 30 years of risk and hazard management.**

HE Process Area (Operable Unit 4)

Table D-1.11. Module D - Ground water extraction and treatment of VOCs and nitrate at the leading edge of the Building 815 TCE plume.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct B815-TF1	SWAT-GAC	1	ea	116,562		
Site Preparation	GWTU	1	ea	150,000		
Construct B815-TF2	GWTU-GBI	1	ea	231,780		
Construct pipeline	Length of pipeline	50	ft	7,900		
Hookup wells	Wells	2	ea	40,204		
Construct discharge pipeline	Length of pipeline	450	ft	13,500		
Subtotal costs				**609,946**	**77,029**	**0**
O & M - B815-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			27,877
Mechanical O & M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	1	ea			1,768
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters	Canisters	0.02	ea			6
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**166,325**
O & M - B815-TF2						
Control/inst. calibration and maintenance	Treatment systems	1	ea			52,353
Mechanical O & M (GWTU)	Treatment systems	1	ea			46,724
Facility documentation and data collection	Treatment systems	1	ea			32,013
Remedial system permit report	Treatment systems	1	ea			34,124
Extraction well sampling & analysis	Extraction wells	1	ea			1,768
Dispose of GW GAC canisters (200 lb)	Canisters	0.2	ea			61
Subtotal costs				**0**	**0**	**167,043**
Total costs				**609,946**	**77,029**	**333,368**

Cost summary

Capital costs	**$687,000**
Present worth of O&M costs[a]	**$5,125,000**
Total present worth costs	**$5,812,000**

[a] **O&M assumes 30 years of ground water extraction.**

HE Process Area (Operable Unit 4)

Table D-1.12. Module E - Ground water extraction and treatment of VOCs, HE compounds, nitrate, and perchlorate released from Building 815 and the high explosives rinsewater lagoons.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wllfield						
Drilling preparation	New wells	1	ea	2,614		
Drilling	New wells	1	ea	4,051		
Drilling footage	Avg. depth of wells	100	ft	17,600		
Well design and construction	New wells	1	ea	8,645		
Hydraulic testing	Pump tests	8	ea		101,040	
Subtotal costs				**32,910**	**101,040**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	4	ea	200,000		
Construct B815-TF3 through B815-TF6	SWAT-GBI	4	ea	749,732		
Construct pipeline	Length of pipeline	850	ft	134,300		
Hookup wells	Wells	8	ea	160,816		
Construct discharge pipe	Length of pipeline	450	ft	13,500		
Subtotal costs				**1,258,348**	**77,029**	**0**
O & M - B815-TF3 through B815-TF6						
Control/inst. calibration and maintenance	Treatment systems	4	ea			334,528
Mechanical O & M (SWAT)	Treatment systems	4	ea			208,884
Facility documentation and data collection	Treatment systems	4	ea			128,040
Extraction well sampling & analysis	Extraction wells	8	ea			14,144
Remedial system permit report	Treatment systems	4	ea			136,496
Dispose of GW GAC canisters (200 lb)	Canisters	2	ea			606
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**841,014**
Total costs				**1,291,258**	**178,069**	**841,014**

Cost summary

Capital costs	**$1,469,000**
Present worth of O&M costs[a]	**$12,928,000**
Total present worth costs	**$14,397,000**

[a] **O&M assumes 30 years of ground water extraction.**

HE Process Area (Operable Unit 4)

Table D-1.13. Module F - Ground water extraction and treatment of VOCs, perchlorate and nitrate released from the HE Burn Pit.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wllfield						
Drilling preparation	New wells	1	ea	2,614		
Drilling	New wells	1	ea	4,051		
Drilling footage	Avg. depth of wells	100	ft	17,600		
Well design and construction	New wells	1	ea	8,645		
Hydraulic testing	Pump tests	3	ea		37,890	
Subtotal costs				**32,910**	**37,890**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct B815-TF7	SWAT-GBI	1	ea	187,433		
Construct pipeline	Length of pipeline	100	ft	15,800		
Hookup wells	Wells	3	ea	60,306		
Subtotal costs				**313,539**	**77,029**	**0**
O & M - B815-TF7						
Control/inst. calibration and maintenance	Treatment systems	1	ea			83,632
Mechanical O & M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,010
Extraction well sampling & analysis	Extraction wells	3	ea			5,304
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters	Canisters	1	ea			303
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**225,910**
Total costs				**346,449**	**114,919**	**225,910**

Cost summary

Capital costs	**$461,000**
Present worth of O&M costs[a]	**$3,473,000**
Total present worth costs	**$3,934,000**

[a] **O&M assumes 30 years of ground water extraction.**

Pit 7 Complex (Operable Unit 5)

Table D-1.14. Module B - Monitoring of ground water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	45	ea			3,645
Water quality sampling / analysis	Wells sampled quarterly	45	ea			113,310
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	45	ea			5,985
Subtotal costs				**0**	**0**	**141,340**
Total costs				**0**	**0**	**141,340**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$2,173,000**
Total present worth costs	**$2,173,000**

[a] **O&M assumes 30 years of monitoring.**

Pit 7 Complex (Operable Unit 5)

Table D-1.15. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Ambient air sampling (tritium)	Location	1	ea			2,780
Conduct wildlife survey	Survey	2	ea			3,297
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**13,037**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**13,769**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$212,000**
Total present worth costs	**$230,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Pit 7 Complex (Operable Unit 5)

Table D-1.16. Module D - Monitored natural attenuation of tritium in ground water and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Data analysis & representation	Labor	100	ea			9200
Modeling	Labor	100	ea			9200
Subtotal costs						**18,400**
Total costs						**18,400**
Cost summary						
Capital costs		**$0**				
Present worth of O&M costs[a]		**$283,000**				
Total present worth costs		**$283,000**				

[a] **O&M assumes 30 years of monitoring.**

Pit 7 Complex (Operable Unit 5)

Table D-1.17. Module E - Ground water extraction and treatment of VOCs south of Landfill Pit 5.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Ground water wellfield						
Drilling preparation (injection well)	New wells	1	ea	2,614		
Drilling (injection well)	New wells	1	ea	4,051		
Drilling footage (injection well)	Avg. depth of wells	30	ft	5,280		
Well design and construction (injection well)	New wells	1	ea	8,645		
Hydraulic testing-extraction & injection wells	Pump tests	4	ea		50,520	
Subtotal costs				**20,590**	**50,520**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct B850-TF1	SWAT-GIX	1	ea	163,493		
Construct pipeline	Length of pipeline	250	ft	39,500		
Construct pipeline (injection well)	Length of pipeline	2200	ft	224,400		
Hookup wells (extraction & injection wells)	Wells	4	ea	75,204		
Subtotal costs				**552,597**	**77,029**	**0**
O & M - B850-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			55,755
Mechanical O & M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,010
Extraction well sampling & analysis	Extraction wells	3	ea			5,304
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of ion-exchange resin	Volume	1	cy			544
Dispose of GW GAC canisters (200 lb)	Canisters	0.003	ea			1
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**198,275**
Total costs				**573,187**	**127,549**	**198,275**

Cost summary

Capital costs	**$701,000**
Present worth of O&M costs[a]	**$3,048,000**
Total present worth costs	**$3,749,000**

[a] **O&M assumes 30 years of ground water extraction.**

Pit 7 Complex (Operable Unit 5)

Table D-1.18. Module F - Ground water extraction and treatment of uranium-238 and nitrate.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wellfield						
Drilling preparation-extraction&injection wells	New wells	10	ea	26,140		
Drilling-extraction&injection wells	New wells	10	ea	40,510		
Drilling footage-extraction&injection wells	Avg. depth of wells	30	ft	52,800		
Well design and construction-extraction&injectio	New wells	10	ea	86,450		
Hydraulic testing-extraction&injection wells	Pump tests	16	ea		202,080	
Subtotal costs				**205,900**	**202,080**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct B850-TF1	SWAT-BIX	1	ea	234,363		
Construct pipeline	Length of pipeline	3100	ft	489,800		
Construct pipeline (injection well)	Length of pipeline	2000	ft	216,000		
Hookup wells	Wells	11	ea	206,811		
Subtotal costs				**1,196,974**	**77,029**	**0**
O & M - B850-TF2 and TF3						
Control/inst. calibration and maintenance	Treatment systems	1	ea			83,623
Mechanical O & M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	11	ea			19,448
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of ion exchange resin	Volume	1	cy			554
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**240,299**
Total costs				**1,402,874**	**279,109**	**240,299**

Cost summary

Capital costs	**$1,682,000**
Present worth of O&M costs[a]	**$3,694,000**
Total present worth costs	**$5,376,000**

[a] **O&M assumes 30 years of ground water extraction.**

Pit 7 Complex (Operable Unit 5)

Table D-1.19. Module G - Control migration of uranium-238 in ground water using an *in situ* reactive permeable barrier.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wellfield						
Drilling preparation	New wells	5	ea	13,070		
Drilling	New wells	5	ea	20,255		
Drilling footage	Avg. depth of wells	30	ft	26,400		
Well design and construction	New wells	5	ea	43,225		
Hydraulic testing	Pump tests	5	ea		63,150	
Subtotal costs				**102,950**	**0**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Construct iron filings wall	Sets of walls	1	ea	2,086,000		
Treatability study	Labor	200	hr		18,400	
Subtotal costs				**2,086,000**	**77,029**	**0**
Total costs				**2,188,950**	**77,029**	**0**
Present worth of replacement walls at years 10 and 20.						
Construct iron filings walls	Sets of walls	1	ea	2,075,000		

Cost summary

Capital costs (Initial)	**$2,266,000**
Present worth of O&M costs	**$0**
Total present worth costs	**$4,341,000**

Pit 7 Complex (Operable Unit 5)

Table D-1.20. Module H - Waste characterization with contingent monitoring or excavation of Landfill Pits 3 and 5.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Waste characterization						
Characterization of Pit 3	Number of Pits	1	ea		251,600	
Characterization of Pit 5	Number of Pits	1	ea		251,600	
Subtotal costs				**0**	**503,200**	**0**
Monitoring - The pit monitoring costs are the same as for the Monitoring Module B, and are not included here.						
Excavation of Landfill Pit 3 with offsite disposal						
Remedial design report	Reports	1	ea		31,070	
Permitting	Permits	1	ea		9,160	
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	153,502		
Excavate - Volume Dependent Costs	Volume	26200	cy	7,388,400		
Low level waste disposal	Volume	26200	cy	14,514,800		
Subtotal costs				**22,056,702**	**40,230**	**0**
Excavation of Landfill Pit 5 with offsite disposal						
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	32,019		
Excavate - Volume Dependent Costs	Volume	29900	cy	8,431,800		
Low level waste disposal	Volume	29900	cy	16,564,600		
Subtotal costs				**24,996,400**	**0**	**0**

		Offsite disposal	
Cost summary	**Waste Characterization**	**Excavation Pit 3**	**Excavation Pit 5**
Capital costs	**$503,000**	**$22,097,000**	**$24,996,000**
Present worth of O&M costs	**$0**	**$0**	**$0**
Total present worth costs	**$503,000**	**$22,097,000**	**$24,996,000**

Note A: Fixed costs include pre-job planning for all excavations at Site 300 and these are arbitrarily assigned to the Pit 3 excavation. There are mob/demob costs for excavations at Pits 3 & 5 and these are arbitrarily assigned to Pit 3 excavation. There are costs for excavation confirmation sampling and analysis which are deemed fixed but amount to only about $30,000 for each pit.

Building 850 (Operable Unit 5)

Table D-1.21. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	47	ea			3,807
Water quality sampling/analysis	Wells sampled quarterly	47	ea			118,346
Surface water quality sampling/analysis	Locations sampled quarterly	1	ea			2,429
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	47	ea			6,251
Subtotal costs				**0**	**0**	**149,233**
Total costs				**0**	**0**	**149,233**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$2,294,000**
Total present worth costs	**$2,294,000**

[a] **O&M assumes 30 years of monitoring.**

Building 850 (Operable Unit 5)

Table D-1.22. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample surface soil (PCBs)	Location	1	ea			477
Sample surface soil (dioxins/furans)	Location	1	ea			1,943
Conduct wildlife survey	Survey	2	ea			3,297
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**12,677**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**13,409**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$206,000**
Total present worth costs	**$224,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Building 850 (Operable Unit 5)

Table D-1.23. Module D - Monitored natural attenuation of tritium in ground water and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Data analysis & representation	Labor	100	ea			9200
Modeling	Labor	100	ea			9200
Subtotal costs						**18,400**
Total costs						**18,400**
Cost summary						
Capital costs		**$0**				
Present worth of O&M costs[a]		**$283,000**				
Total present worth costs		**$283,000**				

[a] **O&M assumes 30 years of monitoring.**

Building 850 (Operable Unit 5)

Table D-1.24. Module E - Ground water extraction and treatment of uranium-238 and nitrate.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wellfield						
Drilling preparation-extraction&injection wells	New wells	5	ea	13,070		
Drilling-extraction&injection wells	New wells	5	ea	20,255		
Drilling footage-extraction&injection wells	Avg. depth of wells	30	ft	26,400		
Well design and construction-extraction&injectio	New wells	5	ea	43,225		
Hydraulic testing-extraction&injection wells	Pump tests	9	ea		113,670	
Subtotal costs				**102,950**	**113,670**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct B850-TF2	SWAT-BIX	1	ea	234,363		
Construct pipeline	Length of pipeline	1600	ft	252,800		
Construct pipeline (injection well)	Length of pipeline	600	ft	64,800		
Hookup wells	Wells	4	ea	75,204		
Subtotal costs				**677,167**	**77,029**	**0**
O & M - B850-TF2 and TF3						
Control/inst. calibration and maintenance	Treatment systems	1	ea			83,623
Mechanical O & M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	4	ea			7,072
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of ion exchange resin	Volume	1	cy			554
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**227,923**
Total costs				**780,117**	**190,699**	**227,923**

Cost summary

Capital costs	**$971,000**
Present worth of O&M costs[a]	**$3,504,000**
Total present worth costs	**$4,475,000**

[a] **O&M assumes 30 years of ground water extraction.**

Building 850 (Operable Unit 5)

Table D-1.25. Module F - Control migration of uranium-238 in ground water using an *in situ* reactive permeable barrier.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install ground water wellfield						
Drilling preparation	New wells	8	ea	20,912		
Drilling	New wells	8	ea	32,408		
Drilling footage	Avg. depth of wells	30	ft	42,240		
Well design and construction	New wells	8	ea	69,160		
Hydraulic testing	Pump tests	8	ea		101,040	
Subtotal costs				**164,720**	**0**	**0**
Design and construct remediation system						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Construct iron filings wall	Sets of walls	1	ea	1,337,000		
Treatability study	Labor	200	hr		18,400	
Subtotal costs				**1,337,000**	**77,029**	**0**
Total costs				**1,501,720**	**77,029**	**0**
Present worth of replacement walls at years 10 and 20.						
Construct iron filings walls	Sets of walls	1	ea	1,797,000		

Cost summary

Capital costs	**$1,579,000**
Present worth of O&M costs	**$0**
Total present worth costs	**$3,376,000**

Building 850 (Operable Unit 5)

Table D-1.26. Module G - Excavation of contaminated soil and bedrock underlying the Building 850 Firing Table, removal of the contamintated sandpile, and removal of contaminated soil adjacent to the firing table.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Excavate contaminated soil and bedrock underlying the Building 850 Firing Table with offsite disposal						
Remedial design report	Reports	1	ea		31,070	
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	165,509		
Excavate - Volume Dependent Costs	Volume	5000	cy	1,410,000		
Low level waste disposal	Volume	5000	cy	2,770,000		
Subtotal costs				**4,345,509**	**31,070**	**0**
Remove the contaminated sandpile at the Building 850 Firing Table with offsite disposal						
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	4,002		
Excavate - Volume Dependent Costs	Volume	460	cy	129,720		
Low level waste disposal	Volume	460	cy	254,840		
Subtotal costs				**384,560**	**0**	**0**
Remove surface soil adjacent to the Buiding 850 Firing Table with offsite disposal						
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	14,675		
Excavate - Volume Dependent Costs	Volume	800	cy	225,600		
Low level waste disposal	Volume	800	cy	443,200		
Subtotal costs				**683,475**	**0**	**0**
Total costs				**5,413,544**	**31,070**	**0**

	Offsite disposal
Cost summary	
Capital costs	**$5,445,000**
Present worth of O&M costs	**$0**
Total present worth costs	**$5,445,000**

Note A: Fixed costs include mob/demob costs for excavations at the Building 850 area and these are arbitrarily assigned to the Building 850 Firing Table excavation. There are costs for excavation confirmation sampling and analysis which are deem fixed but do not exceed about $40,000.

Pit 2 (Operable Unit 5)

Table D-1.27. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	8	ea			648
Water quality sampling/analysis	Wells sampled quarterly	8	ea			20,144
Surface water quality sampling/analysis	Locations sampled quarterly	1	ea			2,429
Data analysis & representation	Labor	100	hr			9,200
Pump maintenance or replacement	Wells	8	ea			1,064
Subtotal costs				**0**	**0**	**33,485**
Total costs				**0**	**0**	**33,485**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$515,000**
Total present worth costs	**$515,000**

[a] **O&M assumes 30 years of monitoring.**

Pit 2 (Operable Unit 5)

Table D-1.28. Module C - Waste characterization with contingent monitoring, capping, or excavation of Landfill Pit 2.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Waste characterization						
Characterization of Pit 2	Number of Pits	1	ea		251,600	
Subtotal costs				**0**	**251,600**	**0**
Monitoring - The pit monitoring costs are the same as for the Monitoring Module B, and are not included here.						
Capping						
Title I/II design	Reports	1	ea		150,000	
Contractor/third party design	Reports	1	ea		22,500	
Post-closure plan	Reports	1	ea		50,000	
Construction contractor	Area	90000	sq.ft	629,100		
CQA contractor	Area	90000	sq.ft	82,120		
Title III design support	Labor	1	ls	10,000		
Construction project management	Labor	1	ls	82,120		
Annual maintenance	Labor	1	ls			10,000
Subtotal costs				**803,340**	**222,500**	**10,000**
Excavation with offsite disposal						
Remedial design report	Reports	1	ea		31,070	
Permitting	Permits	1	ea		9,160	
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	153,502		
Excavate - Volume Dependent Costs	Volume	25412	cy	7,166,184		
Low level waste disposal	Cubic Yards	25412	cy	14,078,248		
Subtotal costs				**21,397,934**	**40,230**	**0**

Cost summary	Waste Characterization	Capping	Offsite disposal Excavation
Capital costs	**$252,000**	**$1,026,000**	**$21,438,000**
Present worth of O&M costs	**$0**	**$154,000**	**$0**
Total present worth costs	**$252,000**	**$1,180,000**	**$21,438,000**

[a] **O&M assumes 30 years of monitoring.**

Note A: Fixed costs include mob/demob costs for excavations at Pit 2 area and these are assigned to the Pit 2 excavation. There are costs for excavation confirmation sampling and analysis which are deem fixed but do not exceed about $28,000.

Building 854 (Operable Unit 6)

Table D-1.29. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	14	ea			1,134
Water quality sampling/analysis	Wells sampled quarterly	14	ea			35,252
Surface water quality sampling/analysis	Locations sampled quarterly	2	ea			4,858
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	14	ea			1,862
Subtotal costs				**0**	**0**	**61,506**
Total costs				**0**	**0**	**61,506**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$945,000**
Total present worth costs	**$945,000**

[a] **O&M assumes 30 years of monitoring.**

Building 854 (Operable Unit 6)

Table D-1.30. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample ambient air (VOCs)	Location	2	ea			2,898
Sample surface soil (PCBs)	Location	1	ea			477
Conduct wildlife survey	Survey	2	ea			3,297
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**13,631**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**14,364**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$221,000**
Total present worth costs	**$239,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Building 854 (Operable Unit 6)

Table D-1.30. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample ambient air (VOCs)	Location	2	ea			2,898
Sample surface soil (PCBs)	Location	1	ea			477
Conduct wildlife survey	Survey	2	ea			3,297
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**13,631**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**14,364**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$221,000**
Total present worth costs	**$239,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Building 854 (Operable Unit 6)

Table D-1.31. Module D - Ground water and soil vapor extraction and treatment of VOCs and nitrate.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water and SVE Wellfield						
Drilling preparation	New wells	13	ea	33,982		
Drilling (water wells)	New wells	7	ea	28,357		
Drilling footage (water wells)	Avg. depth of wells	160	ft	197,120		
Drilling (vapor wells)	New wells	6	ea	24,306		
Drilling footage (vapor wells)	Avg. depth of wells	30	ft	31,680		
Well design and construction	New wells	13	ea	112,385		
Hydraulic testing	Pump tests	9	ea		113,670	
Soil vapor testing	SVE tests	4	ea		48,116	
Subtotal costs				**427,830**	**161,786**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	GWTU	1	ea	150,000		
Construct treatment system (B854-TF1)	GWTU-GBI-SVE	1	ea	364,517		
Site Preparation	SWAT	1	ea	50,000		
Construct treatment system (B854-TF2)	SWAT-GBI	1	ea	187,433		
Construct pipeline	Length of pipeline	900	ft	142,200		
Hook up wells	Wells	15	ea	301,530		
Subtotal costs				**1,195,680**	**77,029**	**0**
O&M - B854-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			69,804
Mechanical O&M (GWTU)	Treatment systems	1	ea			46,724
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	12	ea			21,216
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters (200 lb)	Canisters	2	ea			606
Dispose of SVE GAC canisters (140 lb)	Canisters	3	ea			2,133
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**224,936**
O&M - B854-TF2						
Control/inst. calibration and maintenance	Treatment systems	1	ea			83,632
Mechanical O&M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	3	ea			5,304
Dispose of GW GAC canisters (200 lb)	Canisters	0.2	ea			61
Subtotal costs				**0**	**0**	**173,231**
Total costs				**1,623,510**	**238,815**	**398,167**

Cost summary

Capital costs	**$1,862,000**
Present worth of O&M costs[a]	**$6,104,000**
Total present worth costs	**$7,966,000**

[a] **O&M assumes 30 years of ground water extraction, and 10 years of soil vapor extraction.**

Building 832 Canyon (Operable Unit 7)

Table D-1.32. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	51	ea			4,131
Water quality sampling/analysis	Wells sampled quarterly	51	ea			128,418
Surface water quality sampling/analysis	Locations sampled quarterly	1	ea			2,429
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	51	ea			6,783
Subtotal costs				**0**	**0**	**160,161**
Total costs				**0**	**0**	**160,161**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$2,462,000**
Total present worth costs	**$2,462,000**

[a] **O&M assumes 30 years of monitoring.**

Building 832 Canyon (Operable Unit 7)

Table D-1.33. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample ambient air (VOCs)	Location	3	ea			4,346
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**11,306**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**12,039**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$185,000**
Total present worth costs	**$203,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Building 832 Canyon (Operable Unit 7)

Table D-1.34. Module D - Ground water and soil vapor extraction and treatment of VOCs, perchlorate, and nitrate at Building 832.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water and SVE Wellfield						
Drilling preparation	New wells	1	ea	2,614		
Drilling (water wells)	New wells	1	ea	4,051		
Drilling footage (water wells)	Avg. depth of wells	40	ft	7,040		
Well design and construction	New wells	1	ea	8,645		
Hydraulic testing	Pump tests	8	ea		101,040	
Soil vapor testing	SVE tests	4	ea		48,116	
Subtotal costs				**22,350**	**149,156**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	GWTU	1	ea	150,000		
Construct treatment system (B832-TF1)	GWTU-GBI-SVE	1	ea	364,517		
Site Preparation	SWAT	2	ea	100,000		
Construct treatment system (B832-TF2)	SWAT-GBI	1	ea	187,433		
Construct treatment system (B832-TF3)	SWAT-GBI	1	ea	187,433		
Construct pipeline	Length of pipeline	775	ft	122,450		
Hook up wells	Wells	14	ea	281,428		
Subtotal costs				**1,393,261**	**77,029**	**0**
O&M - B832-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			69,804
Mechanical O&M (GWTU)	Treatment systems	1	ea			46,724
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	10	ea			17,680
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters (200 lb)	Canisters	1	ea			303
Dispose of SVE GAC canisters (140 lb)	Canisters	2	ea			1,422
Manage wellfield flow	Treatment systems	1	ea			18,316
				0	**0**	**220,386**
O&M - B832-TF2 and B832-TF3						
Control/inst. calibration and maintenance	Treatment systems	2	ea			167,264
Mechanical O&M (SWAT)	Treatment systems	2	ea			104,442
Facility documentation and data collection	Treatment systems	2	ea			64,026
Extraction well sampling & analysis	Extraction wells	4	ea			7,072
Dispose of GW GAC canisters (200 lb)	Canisters	1	ea			303
Subtotal costs				**0**	**0**	**343,107**
Total costs				**1,415,611**	**226,185**	**563,493**

Cost summary

Capital costs	**$1,642,000**
Present worth of O&M costs[a]	**$8,651,000**
Total present worth costs	**$10,293,000**

[a] **O&M assumes 30 years of ground water extraction, and 10 years of soil vapor extraction.**

Building 832 Canyon (Operable Unit 7)

Table D-1.35. Module E - Ground water and soil vapor extraction and treatment of VOCs, perchlorate, and nitrate at Building 830.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water and SVE Wellfield						
Drilling preparation	New wells	6	ea	15,684		
Drilling (shallow wells)	New wells	4	ea	16,204		
Drilling footage (shallow wells)	Avg. depth of wells	50	ft	35,200		
Drilling (deep wells)	New wells	2	ea	8,102		
Drilling footage (deep wells)	Avg. depth of wells	100	ft	35,200		
Well design and construction	New wells	6	ea	51,870		
Hydraulic testing	Pump tests	11	ea		138,930	
Soil vapor testing	SVE tests	4	ea		48,116	
Subtotal costs				**162,260**	**187,046**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	GWTU	1	ea	150,000		
Construct treatment system (B830-TF1)	GWTU-GBI-SVE	1	ea	364,517		
Site Preparation	SWAT	2	ea	100,000		
Construct treatment system (B830-TF2)	SWAT-GBI	1	ea	187,433		
Construct treatment system (B830-TF3)	SWAT-GBI	1	ea	187,433		
Construct pipeline	Length of pipeline	1,010	ft	159,580		
Hook up wells	Wells	15	ea	301,530		
Subtotal costs				**1,450,493**	**77,029**	**0**
O&M - B830-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			69,804
Mechanical O&M (GWTU)	Treatment systems	1	ea			46,724
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	10	ea			17,680
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters (200 lb)	Canisters	7	ea			2,121
Dispose of SVE GAC canisters (140 lb)	Canisters	12	ea			8,532
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**229,314**
O&M - B830-TF2 and B830-TF3						
Control/inst. calibration and maintenance	Treatment systems	2	ea			167,264
Mechanical O&M (SWAT)	Treatment systems	2	ea			104,442
Facility documentation and data collection	Treatment systems	2	ea			64,026
Extraction well sampling & analysis	Extraction wells	5	ea			8,840
Dispose of GW GAC canisters (200 lb)	Canisters	1	ea			303
Subtotal costs				**0**	**0**	**344,875**
Total costs				**1,612,753**	**264,075**	**574,189**
Cost summary						
Capital costs	**$1,877,000**					
Present worth of O&M costs[a]	**$8,761,000**					
Total present worth costs	**$10,638,000**					

[a] **O&M assumes 30 years of ground water extraction, and 10 years of soil vapor extraction.**

Building 832 Canyon (Operable Unit 7)

Table D-1.36. Module F - Downgradient ground water extraction using a siphon with *ex situ* treatment of VOCs by iron filings.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water and SVE Wellfield						
Drilling preparation	New wells	6	ea	15,684		
Drilling	New wells	6	ea	24,306		
Drilling footage	Avg. depth of wells	70	ft	73,920		
Well design and construction	New wells	6	ea	51,870		
Hydraulic testing	Pump tests	5	ea		63,150	
Subtotal costs				**165,780**	**63,150**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,070	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Bench and field column tests	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Construct treatment system	Treatment system	1	ea	95,000		
Start-up testing	Labor	200	hr		18,400	
Construct pipeline	Length of pipeline	2,000	ft	204,000		
Hook up wells	Wells	4	ea	80,408		
Subtotal costs		1		**379,408**	**113,828**	**0**
O&M - B832-TF?						
Control/inst. calibration and maintenance	Treatment systems	1	ea			17,451
Mechanical O&M (GWTU)	Treatment systems	1	ea			46,724
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Treatment systems	6	ea			10,608
Remedial system permit report	Treatment systems	1	ea			34,124
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**159,236**
Total costs				**545,188**	**176,978**	**159,236**

Cost summary

Capital costs	**$722,000**
Present worth of O&M costs[a]	**$2,448,000**
Total present worth costs	**$3,170,000**

[a] **O&M assumes 30 years of ground water treatment.**

Building 801 and Landfill Pit 8 (Operating Unit 8)

Table D-1.37. Module B - Monitoring of ground water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	6	ea			486
Water quality sampling / analysis	Wells sampled quarterly	6	ea			15,108
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	6	ea			798
Subtotal costs				**0**	**0**	**34,792**
Total costs				**0**	**0**	**34,792**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$535,000**
Total present worth costs	**$535,000**

[a] **O&M assumes 30 years of monitoring.**

Building 801 and Landfill Pit 8 (Operating Unit 8)

Table D-1.38. Module C - Waste characterization with contingent monitoring, capping, or excavation of Landfill Pit 8.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Source characterization						
Characterize landfill pit contents	Pit	1	ea		204,999	
Subtotal costs				**0**	**204,999**	**0**
Monitoring - The pit monitoring costs are the same as for the Monitoring Module B, and are not included here.						
Capping						
Title I/II design	Reports	1	ea		70,000	
Contractor/third party design	Reports	1	ea		10,500	
Post-closure plan	Reports	1	ea		50,000	
Construction contractor	Area	105000	sq.ft	698,250		
CQA contractor	Area	105000	sq.ft	89,020		
Title III design support	Labor	1	ls	10,000		
Construction project management	Labor	1	ls	89,020		
Annual maintenance	Labor	1	ls			10,000
Subtotal costs				**886,290**	**130,500**	**10,000**
Excavation with offsite disposal						
Remedial design report	Reports	1	ea		31,071	
Permitting	Permits	1	ea		9,158	
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	182,853		
Excavate - Volume Dependent Costs	Volume	24700	cy	6,965,400		
Low level waste disposal	Volume	24700	cy	13,683,800		
Subtotal costs				**20,832,053**	**40,229**	**0**

Cost summary	Waste Characterization	Capping	Offsite disposal Excavation
Capital costs	**$205,000**	**$1,017,000**	**$20,872,000**
Present worth of O&M costs	**$0**	**$154,000**	**$0**
Total present worth costs	**$205,000**	**$1,171,000**	**$20,872,000**

[a] **O&M assumes 30 years of monitoring.**

Note A: Fixed costs include mob/demob costs for excavations at Pit 8 area and these are assigned to the Pit 8 excavation. There are costs for excavation confirmation sampling and analysis which are deemed fixed but do not exceed about $57,000.

Building 833 (Operating Unit 8)

Table D-1.39. Module B - Monitoring of ground water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	9	ea			729
Water quality sampling / analysis	Wells sampled quarterly	9	ea			22,662
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	9	ea			1,197
Subtotal costs				**0**	**0**	**42,988**
Total costs				**0**	**0**	**42,988**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$661,000**
Total present worth costs	**$661,000**

[a] **O&M assumes 30 years of monitoring.**

Building 833 (Operating Unit 8)

Table D-1.40. Module C - Risk and Hazard Management.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Institutional Controls						
Prepare Building Occupancy and Land Use Plan	Plan	1	ea		3,663	
Review Building Occupancy and Land Use Plan	Report	0.2	ea			733
Install warning signs	Signs	1	lot	535		
Subtotal costs				**535**	**3,663**	**733**
Risk and Hazard Monitoring						
Prepare Risk and Hazard Monitoring Plan	Plan	1	ea		10,990	
Sample ambient air (VOCs)	Location	1	ea			1,449
Prepare Risk and Hazard and RAO Compliance Report	Report	1	ea			6,960
Subtotal costs				**0**	**10,990**	**8,409**
Occupational Safety Procedures						
Prepare Occupational Safety Procedures	Plan	1	ea		2,381	
Subtotal costs				**0**	**2,381**	**0**
Total costs				**535**	**17,034**	**9,141**

Cost summary

Capital costs	**$18,000**
Present worth of O&M costs[a]	**$141,000**
Total present worth costs	**$159,000**

[a] **O&M assumes 30 years of risk and hazard management.**

Building 833 (Operating Unit 8)

Table D-1.41. Module D - Ground water and soil vapor extraction and treatment of VOCs.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water and SVE Wellfield						
Drilling preparation	New wells	4	ea	10,456		
Drilling (vapor wells)	New wells	4	ea	16,204		
Drilling footage (vapor wells)	Avg. depth of wells	35	ft	24,640		
Well design and construction	New wells	4	ea	34,580		
Hydraulic testing	Pump tests	2	ea		25,260	
Soil vapor testing	SVE tests	2	ea		24,058	
Subtotal costs				**85,880**	**49,318**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	GWTU	1	ea	150,000		
Construct treatment system (B833-TF1)	GWTU-GAC-SVE	1	ea	293,646		
Construct pipeline	Length of pipeline	170	ft	26,860		
Hook up wells	Wells	6	ea	120,612		
Subtotal costs				**591,118**	**77,029**	**0**
O&M - B833-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			34,902
Mechanical O&M (GWTU)	Treatment systems	1	ea			46,724
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	2	ea			3,536
Remedial system permit report	Treatment systems	1	ea			34,124
Dispose of GW GAC canisters (200 lb)	Canisters	2	ea			606
Dispose of SVE GAC canisters (140 lb)	Canisters	3	ea			2,133
Manage wellfield flow	Treatment systems	1	ea			18,316
Subtotal costs				**0**	**0**	**172,354**
Total costs				**676,998**	**126,347**	**172,354**

Cost summary

Capital costs	**$803,000**
Present worth of O&M costs[a]	**$2,633,000**
Total present worth costs	**$3,436,000**

[a] **O&M assumes 30 years of ground water extraction, and 10 years of soil vapor extraction.**

Building 845 Firing Table and Landfill Pit 9 (Operating Unit 9)

Table D-1.42. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	4	ea			324
Water quality sampling/analysis	Wells sampled quarterly	4	ea			10,072
Surface water quality sampling/analysis	Locations sampled quarterly	1	ea			2,429
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	4	ea			532
Subtotal costs				**0**	**0**	**31,757**
Total costs				**0**	**0**	**31,757**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$488,000**
Total present worth costs	**$488,000**

[a] **O&M assumes 30 years of monitoring.**

Building 845 Firing Table and Landfill Pit 9 (Operating Unit 9)

Table D-1.43. Module C - Waste characterization with contingent monitoring, capping, or excavation of Landfill Pit 9.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Waste characterization						
Characterize landfill pit contents	Pit	1	ea		204,999	
Subtotal costs				**0**	**204,999**	**0**
Monitoring - The pit monitoring costs are the same as for the Monitoring Module B, and are not included here.						
Capping						
Title I/II design	Reports	1	ea		70,000	
Contractor/third party design	Reports	1	ea		10,500	
Post-closure plan	Reports	1	ea		50,000	
Construction contractor	Area	20000	sq.ft	309,200		
CQA contractor	Area	20000	sq.ft	49,920		
Title III design support	Labor	1	ls	10,000		
Construction project management	Labor	1	ls	49,920		
Annual maintenance	Labor	1	ls			10,000
Subtotal costs				**419,040**	**130,500**	**10,000**
Excavation with offsite disposal						
Remedial design report	Reports	1	ea		31,070	
Permitting	Permits	1	ea		9,160	
Excavate - Fixed Costs (See Note A)	Excavation	1	ea	145,497		
Excavate - Volume Dependent Costs	Volume	7400	cy	2,086,800		
Low level waste disposal	Cubic Yards	7400	ea	4,099,600		
Subtotal costs				**6,331,897**	**40,230**	**0**

Cost summary	Waste Characterization	Capping	Offsite disposal Excavation
Capital costs	**$205,000**	**$550,000**	**$6,372,000**
Present worth of O&M costs	**$0**	**$154,000**	**$0**
Total present worth costs	**$205,000**	**$704,000**	**$6,372,000**

[a] O&M assumes 30 years of monitoring.

Note A: Fixed costs include mob/demob costs for excavations at Pit 9 area and these are assigned to the Pit 9 excavation. There are costs for excavation confirmation sampling and analysis which are deemed fixed but do not exceed about $20,000.

Building 851 Firing Table (Operating Unit 8)

Table D-1.44. Module B - Monitoring of ground and surface water.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Monitoring						
Water levels	Wells measured quarterly	5	ea			405
Water quality sampling/analysis	Wells sampled quarterly	5	ea			12,590
Surface water quality sampling/analysis	Locations sampled quarterly	1	ea			2,429
Data analysis & representation	Labor	200	hr			18,400
Pump maintenance or replacement	Wells	5	ea			665
Subtotal costs				**0**	**0**	**34,489**
Total costs				**0**	**0**	**34,489**

Cost summary

Capital costs	**$0**
Present worth of O&M costs[a]	**$530,000**
Total present worth costs	**$530,000**

[a] **O&M assumes 30 years of monitoring.**

Building 851 Firing Table (Operating Unit 8)

Table D-1.45. Module C - Ground water extraction and treatment of uranium-238.

Activity	Parameter	Quantity	Unit	Direct capital ($)	Indirect capital ($)	Annual O&M ($)
Install Ground Water Wellfield						
Drilling preparation	New wells	2	ea	5,228		
Drilling	New wells	2	ea	8,102		
Drilling footage	Avg. depth of wells	180	ft	63,360		
Well design and construction	New wells	2	ea	17,290		
Hydraulic testing	Pump tests	4	ea		50,520	
Subtotal costs				**93,980**	**50,520**	**0**
Design and Construct Remediation System						
Remedial design report	Reports	1	ea		31,071	
Data analysis & representation	Labor	200	hr		18,400	
Modeling	Labor	200	hr		18,400	
Permitting	Permits	1	ea		9,158	
Site Preparation	SWAT	1	ea	50,000		
Construct treatment system (B851-TF1)	SWAT-IX	1	ea	163,000		
Construct pipeline	Length of pipeline	1,000	ft	158,000		
Hook up wells	Wells	4	ea	80,408		
Subtotal costs				**371,000**	**77,029**	**0**
O&M - B851-TF1						
Control/inst. calibration and maintenance	Treatment systems	1	ea			55,755
Mechanical O&M (SWAT)	Treatment systems	1	ea			52,221
Facility documentation and data collection	Treatment systems	1	ea			32,013
Extraction well sampling & analysis	Extraction wells	4	ea			7,072
Remedial system permit report	Treatment systems	1	ea			34,124
Manage wellfield flow	Treatment systems	1	ea			18,316
Dispose of ion exchange resin	Volume	1	cy			554
Subtotal costs				**0**	**0**	**200,055**
Total costs				**464,980**	**127,549**	**200,055**

Cost summary

Capital costs	**$593,000**
Present worth of O&M costs[a]	**$3,075,000**
Total present worth costs	**$3,668,000**

[a] **O&M assumes 30 years of ground water extraction.**

Appendix D (Section D-2)

Activity Unit Costs

APPENDIX D-2 LIST OF TABLES

Table D-2.1. Activity Unit Costs.

Activity	Direct Capital Cost	Indirect Capital Cos	Annual O&M Cos	Unit
Water levels			$81	per monitor well measured quarterly
Water quality sampling / analysis			$2,518	per monitor well sampled quarterly
Surface water quality sampling / analysis			$2,429	per location sampled quarterly
Data analysis & representation			$92	per hour *
Pump maintenance or replacement			$133	per monitor well in OU
Drilling preparation	$2,614			per well constructed
Drillling	$4,051			per well constructed
Drilling footage	$176			per foot depth, per well constructed
Well design and construction	$8,645			per well constructed
Hydraulic testing		$12,630		per hydraulic test *
Soil vapor testing		$12,029		per SVE test *
Remedial design report		$31,071		per new treatment facility
Modeling			$92	per hour *
Permitting		$9,158		per new treatment facility
Construction site preparation-GWTU	$150,000			per new GWTU treatment facility
Construction site preparation-SWAT	$50,000			per new SWAT treatment facility
Construct GWTU-GAC	$160,909			per new GWTU-GAC unit
Construct GWTU-GBI	$231,780			per new GWTU-GBI facility
Construct GWTU-BIO	$70,871			per new GWTU-BIO facility
Construct GWTU-GAC-SVE	$293,646			per new GWTU-GAC-SVE unit
Construct GWTU-GBI-SVE	$364,517			per new GWTU-GBI-SVE unit
Construct SWAT-GAC	$116,562			per new SWAT-GAC unit
Construct SWAT-GBI	$187,433			per new SWAT-GBI unit
Construct SWAT-BIO	$65,507			per new SWAT-BIO unit-uranium
Construct SWAT-GIX	$163,493			per new SWAT-GIX
Construct SWAT-IX	$163,493			per new SWAT-IX
Construct SWAT-BIX	$234,363			per new SWAT-BIX
Construct pipeline	$158			per linear foot of pipeline construction
Construct gravity injection well pipeline	$102			per linear foot of pipeline construction
Hook up wells	$20,102			per well connected
Cont / InstrCalMainGWTU-GAC			$17,451	per GWTU-GAC facility
Cont / InstrCalMainGWTU-GBI			$52,353	per GWTU-GBI facility
Cont / InstrCalMainGWTU-BIO			$34,902	per GWTU-BIO facility
Cont / InstrCalMainGWTU-GAC-SVE			$34,902	per GWTU-GAC-SVE facility
Cont / InstrCalMainGWTU-GBI-SVE			$69,804	per GWTU-GBI-SVE facility
Cont / Instr Calib-MainSWAT-GAC			$27,877	per SWAT-GAC facility
Cont / Instr Calib-MainSWAT-GBI			$83,632	per SWAT-GBI facility
Cont / Instr Calib-MainSWAT-BIO			$55,755	per SWAT-BIO facility
Cont / Instr Calib-MainSWAT-GIX			$55,755	per SWAT-GIX facility
Cont / Instr Calib-MainSWAT-BIX			$83,632	per SWAT-BIX facility
Mechanical O&M (GWTU)			$46,724	per GWTU facility
Mechanical O & M (SWAT)			$52,221	per SWAT facility.
Dispose of SVE GAC canisters (140 lb)			$711	per canisters per year
Dispose of SVE GAC canisters (2,000 lb)			$3,150	per canisters per year
Dispose of GW GAC canisters (200 lb)			$303	per canisters per year
Dispose of GW GAC canisters (1,000 lb)			$3,891	per canisters per year
Hazardous waste disposal			$300	per cubic yard of waste
Facility documentation and data collection			$32,013	per treatment system
Extraction well sampling & analysis			$1,768	per extraction well sampled quarterly
Manage wellfield flow			$18,316	per OU

Table D-2.1. Activity Unit Costs.

Activity	Direct Capital Cost	Indirect Capital Cos	Annual O&M Cos	Unit
Remedial system permit report			$34,124	per treatment facility
Lowl level waste disposal	$554			per cubic yard of material disposed
B834 Module D				
Modify B834 SVE system	$145,158			per B834-SVE facility
Add-on bioreactor to existing facility	$70,871			per B834-SVE facility
Control / inst.calibration and maintenance			$79,888	per GWTU-GIX-SVE facility
Mechical O&M(GWTU)			$134,333	per GWTU facility
Replace GAC-Vapor 55gal / 140#			$711	per canisters per year
Dispose of SVE GAC canisters (2,000 lb)			$3,150	per canisters per year
Replace GAC-Aqueous 55gal / 200#			$303	per canisters per year
Dispose of GW GAC canisters (1,000 lb)			$3,891	per canisters per year
Facility documentation and data collection			$181,500	per facility per year
Extraction well sampling and analysis			$105,248	per facility per year
Data analysis & representation			$15,117	per facility per year
Manage wellfield flow			$20,868	per facility per year
Remedial system permit report			$46,800	per facility per year
B834 Module E				
Perform microorganismexperiments		$92		per hour
Drilling preparation	$2,614			per well constructed
Drillling	$4,051			per well constructed
Drilling footage	$176			per foot depth, per well constructed
Well design and construction	$8,645			per well constructed
Hydraulic testing		$12,630		per hydraulic test *
Remedial design report		$31,071		per new treatment facility
Operate injection wellfield			$60	per hour
Data analysis & representation		$92		per hour
Modeling		$92		per hour
Water quality sampling and analysis			$5,037	per monitor well sampled quarterly
B832 Module F				
Drilling preparation	$2,614			per well constructed
Drillling	$4,051			per well constructed
Drilling footage	$176			per foot depth, per well constructed
Well design and construction	$8,645			per well constructed
Hydraulic testing		$12,630		per hydraulic test *
Remedial design report		$31,071		per new treatment facility
Modeling		$92		per hour
Bench and field column tests			$92	per hour
Hook up wells	$20,102			per well connected
Construct pipeline	$102			per linear foot of pipeline construction
Start-up testing			$92	per hour
Water quality sampling and analysis			$2,518	per monitor well sampled quarterly
Remedial system permit report			$34,124	per treatment facility
Waste Characterization				
Waste Characterization Pits 2, 3, & 5		$251,562		per disposal pit characterized
Waste Characterization - Pits 8 & 9		$204,999		per disposal pit characterized
Excavation and Disposal Costs				

Table D-2.1. Activity Unit Costs.

Activity	Direct Capital Cost	Indirect Capital Cost	Annual O&M Cost	Unit
Pit 3 - Mob/Site Prep, Excavation Confirmation Sampling, & Demob	$153,502			per site
Pit 5 - Excavation Confirmation Sampling	$32,019			per site
B850 Firing Table - Mob/Site Prep, Excavation Confirmation Sampling, & Demob	$165,509			per site
B850 Sand Pile - Excavation Confirmation Sampling	$4,002			per site
B850 Soil - Excavation Confirmation Sampling	$14,675			per site
Pit 2 - Mob/Site Prep, Excavation Confirmation Sampling, & Demob	$153,502			per site
Pit 8 - Mob/Site Prep, Excavation Confirmation Sampling, & Demob	$182,853			per site
Pit 9 - Mob/Site Prep, Excavation Confirmation Sampling, & Demob	$145,497			per site
B845 Firing Table - Excavation Confirmation Sampling	$13,341			per site
B851 Firing Table- Mob/Site Prep, Excavation Confirmation Sampling, & Demob	$136,158			per site
B851 Surface Soil - Excavation Confirmation Sampling	$24,014			per site
Excavation and Off-site Shipping - Variable Volume Costs	$282			per cubic yard
Excavation w/out Off-site Shipping - Variable Volume Costs	$48			per cubic yard
Low Level Waste Disposal Cost	$554			per cubic yard
On-site Disposal - Fixed Cost	$3,609,864			per event
On-site Disposal - Variable Volume Cost	$62			per cubic yard
On-site Disposal - Post-closure monitoring and maintenance				
Pit 3 - Post-closure monitoring and maintenance	$107,188			per site
Pit 5 - Post-closure monitoring and maintenance	$9,880			per site
Building 850 Firing Table - Post-closure monitoring and maintenance	$3,328			per site
Pit 2 - Post-closure monitoring and maintenance	$9,153			per site
Pit 8 - Post-closure monitoring and maintenance	$9,037			per site
Pit 9 - Post-closure monitoring and maintenance	$3,717			per site
Building 845 Firing Table - Post-closure monitoring and maintenance	$3,231			per site
Building 851 Firing Table - Post-closure monitoring and maintenance	$3,085			per site
Capping Pit 2				
Title I/II Design		$150,000		per site
Third party design review		$22,500		per site
Post-Closure Plan		$50,000		per site
Construction	$6.99			per square foot
CQA Contractor	$0.91			per square foot
Title III Design Support		$10,000		per site
Construction Project Management	$0.91			per square foot
Annual Maintenance			$10,000	per year
Capping Pit 8				
Title I/II Design		$70,000		per site
Third party design review		$10,500		per site
Post-Closure Plan		$50,000		per site

Table D-2.1. Activity Unit Costs.

Activity	Direct Capital Cost	Indirect Capital Cos	Annual O&M Cos	Unit
Construction	$6.65			per square foot
CQA Contractor	$0.85			per square foot
Title III Design Support		$10,000		per site
Construction Project Management	$0.85			per square foot
Annual Maintenance			$10,000	per year
Capping Pit 9				
Title I/II Design		$70,000		per site
Third party design review		$10,500		per site
Post-Closure Plan		$50,000		per site
Construction	$15.46			per square foot
CQA Contractor	$2.50			per square foot
Title III Design Support		$10,000		per site
Construction Project Management	$2.50			per square foot
Annual Maintenance			$10,000	per year
B850 *In-situ* Reactive Barrier				
Construct new wall	$1,366,800			per set of walls
P W of replacement walls at years 10 & 20	$1,797,278			per set of walls
Landfill Pit 7 *In-situ* Reactive Barrier				
Construct new wall	$2,086,200			per set of walls
P W of replacement walls at years 10 & 20	$2,704,637			per set of walls
Risk and Hazard Management Activities				
Prepare Building Occupancy and Land Use Restriction Plan		$3,663		per plan
Review Building Occupancy and Land Use Restriction Plan			$3,663	per plan
Install Warning Signs	$535			
Prepare Risk and Hazard Monitoring Plan		$10,990		
Sample Ambient Air (VOCs)			$1,449	
Sample Ambient Air (Tritium)			$2,780	
Sample Surface Soil (PCBs)			$477	
Sample Surface Soil (dioxins/furans)			$1,943	
Conduct Wildlife Survey			$1,648	
Prepare Risk and Hazard and ROA Compliance Report			$6,960	
Prepare Occupational		$2,381		
Install Soil Vapor Monitor Point	$1,757			

*** this may be an ICC or O&M cost**

Appendix D (Section D-3)

Bases of Estimates for Unit Cost of Activities

Appendix D-3 List of Tables

D-3. 43 Review Building Occupancy and Land Use Restriction Plan
D-3. 44 Install warning signs
D-3. 45 Prepare Risk and Hazard Monitoring Plan
D-3. 46 Sample ambient air (VOCs)
D-3. 47 Sample ambient air (tritium)
D-3. 48 Sample surface soil (PCBs)
D-3. 49 Sample surface soil (dioxins/furans)
D-3. 50 Conduct wildlife survey
D-3. 51 Prepare Risk and Hazard and RAO Compliance Report
D-3. 52 Prepare Occupational Safety Procedures
D-3. 53 Install soil vapor monitor point
D-3. 54 Excavation and On-site Disposal of Low Level Radioactive Waste

D-3. Exhibit A
D-3. Exhibit B

99/ERD SWFS:rtd

Table D-3.1. Water levels - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Water levels		
Scope of work	Measure water levels in monitoring wells and enter data in data management system.		
Assumptions	Water levels are measured quarterly		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
SMP005 (Water Levels)	Per well	4	Contract rate.
DMU001 (Water Levels)	Per sample	4	Group leader's estimate based on prior year's experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
SMP005	$ 12.12	4	$48.48
DMU001	$ 8.25	4	$33.00

O&M Cost = $81.48 per well measured monthly

Table D-3.2. Water quality sampling/analysis - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Water quality sampling/analysis		
Scope of work	Monitoring well sample collection & analysis four times a year.		
Assumptions	Average analysis cost is represented by one ANL002, ANL007 and ANL013 per sampling event.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	FTE	1	Task Leader's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per well per year.
LLNL500(Technician)	FTE	1	Sampling technician's task coordination and plan preparation; based on Group Leader's prior years' experience. Use 1 hour per well per year.
LLNL200 (Scientist/Engineer)	FTE	1	Hydrogeologist's's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per well per year.
ANL002 (VOC Water Normal)	Per Sample	4.4	VOC water analysis with normal turnaround of wells + 10% QA/QC samples.
ANL007 (Metals Water Normal)	Per Sample	4.4	Metals water analysis with normal turnaround of wells + 10% QA/QC samples.
ANL013 (Alpha/Beta /H3 Water Normal)	Per Sample	4.4	Alpha/Beta/H3 water analysis with normal turnaround of wells + 10% QA/QC samples.
DMU002 (H2O, Air, Soil Samples)	Per Sample Analysis	13.2	Data management of analytical data for the monitor well data; based on 1 DMU002 unit per analysis.
SMP001 (Normal)	Per Well	4	Sampling of wells; based on sampling contract.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	2	$183.16
LLNL500	$60.24	1	$60.24
ANL002	$60.70	4.4	$267.08
ANL007	$84.34	4.4	$371.10
ANL013	$70.55	4.4	$310.42
DMU002	$75.45	13.2	$995.94
SMP001	$82.58	4	$330.32

O&M Cost = $2,518.26 per Monitoring Well Water Quality Analysis sampled quarterly

Table D-3.3. Surface water quality sampling/analysis - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Surface water quality sampling/analysis		
Scope of work	Monitoring well sample collection & analysis four times a year.		
Assumptions	Average analysis cost is represented by one ANL002, ANL007 and ANL013 per sampling event.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	1	Task Leader's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per location per year.
LLNL500(Technician)	Per hour	5	Sampling technician's task coordination and plan preparation and time to sample; based on Group Leader's prior years' experience. Use 1 hour per location per quarter to sample and 1 hour/year to prepare plan.
LLNL200 (Scientist/Engineer)	Per hour	1	Hydrogeologist's's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per well per year.
ANL002 (VOC Water Normal)	Per Sample	4.4	VOC water analysis with normal turnaround + 10% QA/QC samples.
ANL007 (Metals Water Normal)	Per Sample	4.4	Metals water analysis with normal turnaround + 10% QA/QC samples.
ANL013 (Alpha/Beta/H3 Water Normal)	Per Sample	4.4	Alpha/Beta/H3 water analysis with normal turnaround + 10% QA/QC samples.
DMU002 (H2O, Air, Soil Samples)	Per Sample Analysis	13.2	Data management of analytical data; based on 1 DMU002 unit per analysis.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	2	$183.16
LLNL500	$60.24	5	$301.20
ANL002	$60.70	4.4	$267.08
ANL007	$84.34	4.4	$371.10
ANL013	$70.55	4.4	$310.42
DMU002	$75.45	13.2	$995.94
	Total =	$2,428.90	Per location sampled 4 times a year

Table D-3.4. Data analysis & representation - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Data analysis & representation		
Scope of work	Analize data, organize data and represent data in tables and figures.		
Assumptions			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	1	Hydrogeologist/Engineer - Examine, analyze, interpret and display data.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	1	$91.58

Table D-3.5. Pump maintenance or replacement - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Pump maintenance or replacement		
Scope of work	Maintain/Replace defective monitoring well pumps.		
Assumptions	All wells have a dedicated Grunfos pump and the failure rate is 10% per year. The average depth of wells is 50 feet		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL500 (Technician)	Per hour	15	Technician - Pump change out; based on prior years' experience; two technicians for 7.5 hours each per pump replaced.
TSP031 (Replacement pump - Grundfos)	Each	1	Grunfos pumps with control boxes included - Use 1 pump per well
TSP023 (Misc. Mechanical Equipment)	Per dollars	4.3	(PVC pipe @ $0.30/foot plus pump wire @ $0.56/foot) * [50 feet] = $4.30 per pump replaced

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL500	$60.24	15	$903.60
TSP031	$422.03	1	$422.03
TSP023	$1.09	4.3	$4.69
		Total for all wells	$1,330.32
O&M Cost =	$133.03	per monitor well in OU	

Table D-3.6. Drilling preparation - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Drilling preparation		
Scope of work	Drilling plan preparation, site preparation, and utility survey.		
Assumptions	Grading for drilling site access and site leveling and clearing can be completed in 4 hours Drill rig mobilization and setup/standby time covered Drilling activity. Line locator review of records and survey of underground utilities can be completed in 4 hours		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	4	Drilling Coordinator's verification/justification of drilling/screening location; based on prior years' experience.
LLNL800 (Skilled Crafts)	Per hour	4	Line locator review of records and survey of underground utilities; based on prior years' experience.
LLNL800 (Skilled Crafts)	Per hour	4	Plant Engineering equipment and labor for site preparation and grading; based on prior years' experience.
LLNL500 (Technician)	Per hour	8	Technician assistance with drilling rig during move, setup and drilling preparation; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	8	Archaeologist and biologist review of proposed drilling location; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	8	Hydrogeologist - 4 hrs for workplan/sampling plan preparation, and 4 hrs for drilling coordination; based on prior year's experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	20	$1,831.60
LLNL500	$60.20	8	$481.60
LLNL800	$75.09	4	$300.36
			$2,613.56

Total Cost = $2,613.56

Table D-3.7. Drilling - basis of estimate.

Fiscal Year	1999			Revised 10/16/98
Activity title	Drilling			
Scope of work	Drilling and logging a bore hole.			
Assumptions	Drill rig already mobilized on site. No extra drill rig access charge. No standby time is required for muster. Depth of bore hole is k*30 feet, where k is an integer. Drilling rate is 15 ft/day; and drilling day is 8 hrs long; well logging adds 1 day of MRD003. # of drilling days, Dd = 2*k+1. PVC casing used with 15 feet of slotted section. Only VOCs and metals analyses required			
Resource	**Unit of Application**	**Quantity**	**Quantity as a function of k***	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	4		Hydrogeologist - drilling coordination, and review of lithologic logs, chemistry, and drilling progress; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	8		Hydrogeologist - geologic well log data entry to data base; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	4	16	Drilling Geologist - 8 hrs/drilling day for preparing borehole lithologic and well logs and collecting core samples during drilling, plus 4 hrs of paper work preparation & distribution; based on prior years's experience.
MRD003 (Drilling)	Per hour		16	8 hrs/drilling day for mud-rotary rig drilling and time to transport and dispose of drilling mud; based on prior years' experience.
WEL001 (Mobilization)	Per occurance	1		Mobilization of well loggers based on geophysical logging contract.
WEL014 (Standard Log Suite)	Per foot	90		Standard suite of geophysical logs of bore hole; (minimum of 75 feet, based on geophysical logging contract. Use 90 feet as average borehole depth.
ANL001 (VOC Water Rush)	Per sample	1		1 VOC (EPA 601) water analysis (rush turnaround); based on 1 VOC water sample per well.
ANL003(VOC Soil Rush)	Per sample		3	1 VOC (EPA8010) soil analysis (rush turnaround)/10 feet of bore hole depth; based on prior years' experience.
ANL007 (Metals Water Normal)	Per sample	1		1 Dissolved Drinking Water Metals (DDWM) water analysis; based on 1 DDWM water sample per well.
DMU002 (H2O, Air, Soil Samples)	Per sample	2	3	1 DMU002 per analysis for data management of analytic data

DMU004 (New Sampling Location)	Per sample	1		1 DMU004 per new drill location for data management of location survey and well construction information
DMUOO5 (Reports, Scheduled & Special)	Per report	1		Data management support for well log report to Department of Water Resources.
LLNL800 (Skilled Crafts)	Per hour	4		Survey crew to survey well location and elevation; based on assumption that several wells surveyed at same time and prior years' experience. (4 hrs)

* Assumes a 30 foot deep hole.

Resource	**Unit Cost**		**Quantity**	**Cost**
LLNL200	$91.58	16	16	
LLNL800	$75.09	4		
MRD003	$203.19		16	
WEL001	$1,010.61	1		
WEL014	$6.76	90		
ANL001	$132.14	1		
ANL003	$108.03		3	
ANL007	$84.34	1		
DMU002	$75.45	2	3	
DMU004	$223.98	1		
DMUOO5	$75.45	1		

DC Cost =	$4,051.46	+	$5,266.76	For a 30 foot deep hole
DC Cost =	$4,051.46	+	$175.56	per foot depth

Table D-3.8. Well design and construction - basis of estimate.

Fiscal Year	1999		Revised 10/28/98
Activity title	Well design and construction		
Scope of work	Design and construction of wells through initial water sampling and analysis		
Assumptions	2 days required for design and construction of well. Well depth equals bore hole depth. Depth of bore hole is k*30 feet, where k is an integer. Well material cost is $15/foot		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist and Engineer)	Per hour	2	Drilling Coordinator - coordination for well design and construction; based on prior years' experience.
LLNL500 (Technician)	Per hour	12	Technician - install wellhead and assist with well development; based on prior years' experience.
LLNL200 (Scientist and Engineer)	Per hour	22	Drilling Geologist-2 hrs for well design, 16 hrs for well installation / development, 4 hrs for pump test data; based on prior experience.
MRD003 (Drilling)	Per hour	16	Drilling rig and crew construct and develop well; based on prior years' experience.
ANL002 (VOC Water Normal)	Per sample	2	2 VOC (EPA601) - Analysis of grab sample taken during initial development plus analysis of a baseline sample taken after final development
ANL007 (Metals Water Normal)	Per sample	2	1 NPDES Metals including CR+6 plus 1 General Minerals for analysis of baseline sample.
ANL013 (Alpha/Beta /H3 Water Normal)	Per sample	2	1 Gross alpha/beta plus 1 tritium for analysis of baseline sample.
DMU002 (H2O, Air, Soil Samples)	Per analysis	6	1 DMU002/sample analysis for data management of analytic data.
TSP031 (Gronfos Pump)	Per pump	1	1 Grunfos pump
TSP023 (Misc. Mech Equipment)	Per dollars	77.4	PVC pipe and pump wire @ $0.86/ft; assume well is 90 feet deep.
LLNL500 (Technician)	Per hour	18	Technician - install pump, final development, baseline sample collection, disposal of development water, installation of transducers and running of pump test, disposal of pump water, and downloading data; based on prior years' experience.

Resource	Unit Cost	Quantity	Cost
LLNL200	$91.58	24	2197.92
LLNL500	$60.20	30	1806.00
MRD003	$203.19	16	3251.04
ANL002	$60.70	2	121.40
ANL007	$84.34	2	168.68
ANL013	$70.55	2	141.10
DMU002	$75.45	6	452.70
TSP031	$422.03	1	422.03
TSP023	$1.09	77.4	84.37

DC Cost = $8,645.24 Use $8640

Table D-3.9. Hydraulic testing - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Hydraulic testing		
Scope of work	Two week pump test on well to determine hydraulic characteristics of the aquifer.		
Assumptions	PTU will be used to treat discharge water		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL800 (Skilled Crafts)	Per hour	8	Rigger and fork lift necessary to move PTU into place to treat pumped water; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	44	Engineer support for permits, and hydrogeologist interpret test results; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	10	Hydrogeologist - preparation of Hydraulic Test Plan; based on prior years' experience.
LLNL500 (Technician)	Per hour	80	Technician - hook up temporary piping, operate the PTU; based on prior years' experience.
LLNL500 (Technician)	Per hour	16	Technician - deploy instrumentation in surrounding wells; based on prior years' experience.
ANL002 (VOC Water Normal)	Per sample	9	Daily influent samples for first week; every other day for second week; and weekly effluent samples thereafter
DMU002 (H2O, Air, Soil Samples)	Per sample	9	1 DMU002 per sample analysis for data management of analyses results
DMU005 (Reports, Scheduled & Special)	Per sample	1	1 DMU005 for data management of pump test results

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	54	$4,945.32
LLNL500	$60.24	96	$5,783.04
LLNL800	$75.09	8	$600.72
ANL002	$60.70	9	$546.30
DMU002	$75.45	9	$679.05
DMU005	$75.45	1	$75.45
IC Cost	$12,629.88		

Table D-3.10. SVE testing - basis of estimate.

Fiscal Year	1999		Revised 10/27/98
Activity title	SVE testing		
Scope of work	Two week SVE test on wells to determine hydraulic characteristics of the vadose zone.		
Assumptions			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	44	Engineer support for permits, and hydrogeologist interpret test results; based on prior years' experience.
LLNL200 (Scientist/Engineer)	Per hour	10	Hydrogeologist - preparation of SVE test Plan; based on prior years' experience.
LLNL500 (Technician)	Per hour	80	Technician - hook up temporary piping arrays, operate the test; based on prior years' experience.
LLNL500 (Technician)	Per hour	16	Technician - deploy instrumentation in surrounding wells; based on prior years' experience.
ANL002 (VOC Water Normal)	Per sample	9	Daily influent samples for first week; every other day for second week; and weekly effluent samples thereafter.
DMU002 (H2O, Air, Soil Samples)	Per sample	9	1 DMU002 per sample analysis for data management of analyses results.
DMU005 (Reports, Scheduled & Special)	Per sample	1	1 DMU005 for data management of pump test results.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	54	$4,945.32
LLNL500	$60.24	96	$5,783.04
ANL002	$60.70	9	$546.30
DMU002	$75.45	9	$679.05
DMU005	$75.45	1	$75.45
IC Cost	$12,029.16		

Table D-3.11. Remedial design report - basis of estimate.

Fiscal Year	1999 Revised 10/16/98
Activity title	Remedial design report
Scope of work	Prepare Draft Final & Final RD report including Compliance Monitoring Plan & Contingency Plan; Draft RD document approx. 200 pgs. w/ 30 figures and 22 tables.
Assumptions	Remedial design, compliance monitoring plan and contingency plan strategy is approved by DOE and regulatory agencies w/ moderate changes to technical details based on comments. GSA FY98 experience applies to other Site 300 locations.

Resource	Unit of Application	Quantity	Basis of Estimate
LLNL 200 (Scientist &Engineer)	Per hour	300	Hydrogeologist/Engineer - Document preparation, review and edit; based on number of review hours necessary for draft final and final document of similar size and content.
DMU005 (Reports)	Per report	5	Based on Data Management input for modifications to one report. Use five DMU005's.
SER003 (TID Jobs)	Per/ dollar	2,000	Figure edits in response to comments; based on TID charges for figure edits for draft final and final documents of similar size and content. Estimate based on assumption of minor to moderate changes to 75% of 30 figures.

Resource	Unit Cost	Quantity	Cost
LLNL 200	$ 91.58	300	$27,474.00
DMU005	$ 75.45	5	$377.25
SER003	1.61	2000	$3,220.00

Total $31,071.25

Table D-3.12. Modeling - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Modeling		
Scope of work	Develop and use physical, conceptual and computational models to evaluate the transport of contaminants;		
Assumptions	Data Analysis and Representation is included elsewhere		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	1	Hydrogeologist/Engineer - Develop and use physical, conceptual and computational models to evaluate the transport of contaminants.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	91.58	1	

O&M Cost = $ 91.58 per hour

Table D-3.13. Permitting - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Permitting		
Scope of work	Write permit specifications and negotiate with regulators.		
Assumptions	Preparation and negotiations completed by LLNL200 in 100 hours. For water, no NPDES permit required.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	100	Engineer/Scientist - writing permit specifications, negotiating with regulators, working with ORAD staff; based on prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	100	$9,158.00

Cost = $ 9,158.00

Table D-3.14. Construction Site Preparation - basis of estimate.

Fiscal Year	**Fiscal Year**	1999	Revised 12/16/98
Activity title	**Activity title**	Construction Site Preparation	
Scope of work	**Scope of work**	Mobilize equipment, prepare site, bring power for GWTU	
Assumptions	**Assumptions**	Main site experience applies to S300 with modification for remoteness	

Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**

GWTU Site Preparation Costs

Resource	**Unit Cost**	**Quantity**	**Cost**
	15,000		Site Grading
	10,000		Concrete Pad
	50,000		Power plus Conduits for power and control
	10,000		Site Screen
	10,000		AC Paving
	5,000		Painting
	0		NEPA and similar issues
	100,000		Subtotal
	20,000		Add 20% for remoteness
	120,000		Subtotal
	18,000		Add 15% for Plant Engineering Project Management
	138,000		Total

SWAT Site Preparation Costs

Resource	**Unit Cost**	**Quantity**	**Cost**
	15,000		Site Grading
	10,000		Concrete Pad
	10,000		Site Access
	10,000		AC Paving
	45,000		Subtotal
	9,000		Add 20% for Remoteness
	54,000		Subtotal
	8,100		Add 15% for Plane Engineering Project Management
	62,100		Total

USE	150000	each	Site preparation cost for a GWTU
	50000	each	Site preparation cost for a SWAT

Table D-3.15. Construct GWTU-GAC - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct GWTU-GAC		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new GWTU with aqueous phase GAC		
Assumptions	Prior year's experience applicable.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	200	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	228	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP003 (Treatment System Parts GTU)	Per dollar	31753	Cost of major components
PEJ003 (PEJ Job)	Per dollar	48000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	200	$18,316.00
LLNL300	$81.29	228	$18,534.12
LLNL500	$60.24	640	$38,553.60
TSP003	1.03	$31,753.00	$32,705.59
PEJ003	1.1	$48,000.00	$52,800.00

Capital Cost = $160,909.31

Table D-3.16. Construct GWTU-GBI - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct GWTU-GBI		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new GWTU with aqueous phase GAC followed by a bioreactor for water treatment		
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	200	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	228	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP003 (Treatment System Parts GTU)	Per dollars	31753	Cost of major components
PEJ003 (PEJ Job)	Per dollars	48000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Bioreactor Portion (Labor and PEJ costs are 25% and 10% of GTWU-GAC costs, respectively and parts are $41k).			
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	41000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	Unit Cost	Quantity	Cost
LLNL200	$91.58	250	$22,895.00
LLNL300	$81.29	285	$23,167.65
LLNL500	$60.24	800	$48,192.00
TSP003	1.03	$31,753.00	$32,705.59
GPR005	1.14	$41,000.00	$46,740.00
PEJ003	1.1	$52,800.00	$58,080.00

Capital Cost = $ 231,780.24

Bioreactor Add-on to Existing GWTU-GAC

$ 70,870.93

Table D-3.17. Construct GWTU-GIX - basis of estimate.

Fiscal Year	1999		Revised 12/07/98
Activity title	Construct GWTU-GIX		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new GWTU with aqueous phase GAC followed by an ion exchange unit for uranium treatment.		
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	200	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	228	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP003 (Treatment System Parts GTU)	Per dollars	31753	Cost of major components
PEJ003 (PEJ Job)	Per dollars	48000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Ion Exchange Portion (Labor and PEJ costs are 25% and 10% of GTWU-GAC costs, respectively and parts are $20k).			
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	20000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	Unit Cost	Quantity	Cost
LLNL200	$91.58	250	$22,895.00
LLNL300	$81.29	285	$23,167.65
LLNL500	$60.24	800	$48,192.00
TSP003	1.03	$31,753.00	$32,705.59
GPR005	1.14	$20,000.00	$22,800.00
PEJ003	1.1	$52,800.00	$58,080.00

Capital Cost = $207,840

Bioreactor Add-on to Existing GWTU-GAC

$46,931

Table D-3.18. Construct GWTU-BIO - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct GWTU-BIO		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new GWTU-Bioreactor without GAC		
Assumptions	Labor and PEJ costs are 25% and10% of GTWU-GAC costs, respectively, and parts are $41k.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR004 ($25k to $1M)	Per dollars	41000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	50	$4,579.00
LLNL300	$81.29	57	$4,633.53
LLNL500	$60.24	160	$9,638.40
GPR005	1.14	$41,000.00	$46,740.00
PEJ003	1.1	$4,800.00	$5,280.00

Capital Cost = $ 70,870.93

Table D-3.19. Construct GWTU-GAC-SVE - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct GWTU-GAC-SVE		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new GWTU with aqueous phase GAC and soil vapor extraction with vapor phase GAC		
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	200	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	228	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP003 (Treatment System Parts GTU)	Per dollars	31753	Cost of major components
PEJ003 (PEJ Job)	Per dollars	48000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

SVE Portion

Resource	Unit of Application	Quantity	Basis of Estimate
LLNL200 (Scientist/Engineer)	Per hour	264	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	244	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	560	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP005 (Treatment System Parts VES)	Per dollars	26690	Cost of major components
PEJ003 (PEJ Job)	Per dollars	25000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	Unit Cost	Quantity	Cost
LLNL200	$91.58	464	$42,493.12
LLNL300	$81.29	472	$38,368.88
LLNL500	$60.24	1200	$72,288.00
TSP003 & TSP005	1.03	$58,443.00	$60,196.29
PEJ003	1.1	$73,000.00	$80,300.00

Capital Cost = $ 293,646.29

Table D-3.20. Construct GWTU-GBI-SVE - basis of estimate.

Fiscal Year	1999	Revised 12/04/98
Activity title	Construct GWTU-GBI-SVE	
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new GWTU with aqueous phase GAC followed by a bioreactor for water treatment and vapor phase GAC for vapors.	
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.	
Resource	**Unit of Application**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP003 (Treatment System Parts GTU)	Per dollars	Cost of major components
PEJ003 (PEJ Job)	Per dollars	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Bioreactor Portion (Increase Labor by 25%, parts by $20k and PEJ costs by 10%.		
LLNL200 (Scientist/Engineer)	Per hour	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

SVE Portion

LLNL200 (Scientist/Engineer)	Per hour	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience. (Use 264 hr).
LLNL300 (Technician Supervisor)	Per hour	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience. (Use 116 hr)
LLNL500 (Technician)	Per hour	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience. (Use 560 hr)
TSP005 (Treatment System Parts VES)	Per dollars	Cost of major components
PEJ003 (PEJ Job)	Per dollars	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Cost**
LLNL200	$91.58	$47,072.12
LLNL300	$81.29	$43,002.41
LLNL500	$60.24	$81,926.40
TSP003 & TSP005	1.03	$60,196.29
GPR005	1.14	$46,740.00
PEJ003	1.1	$85,580.00

Capital Cost = $ 364,517.22

Table D-3.21. Construct SWAT-GAC - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct SWAT-GAC		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new SWAT with aqueous phase GAC		
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.		
Resource		**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	264	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	260	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP004 (Treatment System Parts SWAT)	Per dollars	9316	Cost of major components
PEJ003 (PEJ Job)	Per dollars	21000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	264	$24,177.12
LLNL300	$81.29	260	$21,135.40
LLNL500	$60.24	640	$38,553.60
TSP003	1.03	$9,316.00	$9,595.48
PEJ003	1.10	$21,000.00	$23,100.00

Capital Cost = $116,561.60

Table D-3.22. Construct SWAT-GBI - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct SWAT-GBI		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new SWAT with aqueous phase GAC followed by a bioreactor for water treatment		
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	264	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	260	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP004 (Treatment System Parts SWAT)	Per dollars	9316	Cost of major components
PEJ003 (PEJ Job)	Per dollars	21000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Bioreactor Portion (Labor and PEJ costs are 25% and10% of GTWU-GAC costs, respectively and parts are $41k).			
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	41000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	314	$28,756.12
LLNL300	$81.29	317	$25,768.93
LLNL500	$60.24	800	$48,192.00
TSP004	1.03	$9,316.00	$9,595.48
GPR005	1.14	$41,000.00	$46,740.00
PEJ003	1.10	$25,800.00	$28,380.00

Capital Cost = $ 187,432.53

Table D-3.23. Construct SWAT-BIO - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct SWAT-BIO		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new SWAT with a Bioreactor only.		
Assumptions	Labor and PEJ costs are 25% and10% of SWAT-GAC costs, respectively, and parts are $41k.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	66	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	65	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP004 (Treatment System Parts SWAT)	Per dollars	41000	Cost of major components
PEJ003 (PEJ Job)	Per dollars	2100	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	66	$6,044.28
LLNL300	$81.29	65	$5,283.85
LLNL500	$60.24	160	$9,638.40
TSP004	1.03	$41,000.00	$42,230.00
PEJ003	1.1	$2,100.00	$2,310.00

Capital Cost = $ 65,506.53

Table D-3.24. Construct SWAT-GIX - basis of estimate.

Fiscal Year	1999		Revised 12/07/98
Activity title	Construct SWAT-GIX		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new SWAT with aqueous phase GAC followed by an ion exchange unit for water treatment		
Assumptions	Labor and PEJ costs are 25% and10% of SWAT-GAC costs, respectively, and parts are $20k.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	264	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	260	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP004 (Treatment System Parts SWAT)	Per dollars	9316	Cost of major components
PEJ003 (PEJ Job)	Per dollars	21000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Ion Exchange Portion (Labor and PEJ costs are 25% and10% of GTWU-GAC costs, respectively and parts are $20k).			
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	20000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	Unit Cost	Quantity
LLNL200	$91.58	314
LLNL300	$81.29	317
LLNL500	$60.24	800
TSP004	1.03	$9,316.00
GPR005	1.14	$20,000.00
PEJ003	1.10	$25,800.00

Capital Cost = $ 163,492.53

Table D-3.25. Construct SWAT-IX - basis of estimate.

Fiscal Year	1999		Revised 12/07/98
Activity title	Construct SWAT-IX		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new SWAT with an ion exchange unit for water treatment		
Assumptions	Labor and PEJ costs are 25% and10% of SWAT-GAC costs, respectively, and parts are $20k.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	264	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	260	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP004 (Treatment System Parts SWAT)	Per dollars	9316	Cost of major components
PEJ003 (PEJ Job)	Per dollars	21000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Ion Exchange Portion (Labor and PEJ costs are 25% and10% of GTWU-GAC costs, respectively and parts are $20k).			
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	20000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	Unit Cost	Quantity	Cost
LLNL200	$91.58	314	$28,756.12
LLNL300	$81.29	317	$25,768.93
LLNL500	$60.24	800	$48,192.00
TSP004	1.03	$9,316.00	$9,595.48
GPR005	1.14	$20,000.00	$22,800.00
PEJ003	1.10	$25,800.00	$28,380.00

Capital Cost = $ 163,492.53

Table D-3.26. Construct SWAT-BIX - basis of estimate.

Fiscal Year	1999		Revised 12/09/98
Activity title	Construct SWAT-BIX		
Scope of work	Procure equipment, fabricate unit and control assembly, check out system and activate new SWAT with aqueous phase GAC followed by a bioreactor and an ion exchange unit for water treatment		
Assumptions	Unit can be fabricated and made operational for same cost as in previous years.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	264	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	260	Senior Eng'ng Assoc time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's years' experience.
LLNL500 (Technician)	Per hour	640	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
TSP004 (Treatment System Parts SWAT)	Per dollars	9316	Cost of major components
PEJ003 (PEJ Job)	Per dollars	21000	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.
Bioreactor Portion (Labor and PEJ costs are 25% and10% of GTWU-GAC costs, respectively and parts are $41k).			
LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	41000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Ion Exchange Portion (Labor and PEJ costs are 25% and10% of GTWU-GAC costs, respectively and parts are $20k).

LLNL200 (Scientist/Engineer)	Per hour	50	Engineer time to specify equipment parts and to activate system; Group Leader's estimate based on prior years' experience.
LLNL300 (Technician Supervisor)	Per hour	57	Senior Engineering Associate time to specify equipment, fabricate control assembly, perform system check out and to activate unit; based on Group Leader's prior years' experience.
LLNL500 (Technician)	Per hour	160	Technician time to purchase equipment, verify correct shipment, fabricate unit and control assembly, perform system check out and to activate system; based on Group Leader's prior years' experience.
GPR005 ($25k to $1M)	Per dollars	20000	Cost of major components; based on vendor quote.
PEJ003 (PEJ Job)	Per dollars	4800	Cost for plant engineering contractor to fabricate unit, including miscellaneous parts; based on Group Leader's prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	364	$33,335.12
LLNL300	$81.29	374	$30,402.46
LLNL500	$60.24	960	$57,830.40
TSP004	1.03	$9,316.00	$9,595.48
GPR005	1.14	$61,000.00	$69,540.00
PEJ003	1.10	$30,600.00	$33,660.00

Capital Cost = $234,363.46

Table D-3.27. Construct pipeline - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Construct pipeline		
Scope of work	Procure and install all equipment, controls and metering devices to plumb extraction wells to treatment unit.		
Assumptions	Unit costs for GSA OU are applicable to all of Site 300		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200	Per hour	192	Engineer select equipment to be purchased, provide input to site design, and assist in activating system.
LLNL300	Per hour	468	Construction manager/EE TEam Leader select equipment to be purchased, provide input to site design, assist in control assembly design, system checkout, and activating system, and oversee site construction.
LLNL500	Per hour	664	Facility Operator select equipment to be purchased, provide input to site design, assist in control assembly design, system checkout, fabricating pipeline, site construction, and activating system.
GPR001	Per dollar	3200	$400/well for valves, couplings and elbows for 8 wells
PEJ001	Per dollar	10000	Electrical power design
PEJ002	Per dollar	173800	Pipeline construction, above grade - 1100 LF @ $158/LF
GPR005	Per dollar	40000	Wellhead electronics and Flow meters - 8 wells @ $5000 per well.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	192	$17,583.36
LLNL300	$81.29	468	$38,043.72
LLNL500	$60.24	664	$39,999.36
GPR001	$1.09	3200	$3,488.00
GPR005	1.14	$40,000	$45,600.00
PEJ001	1.61	$10,000	$16,100.00
PEJ003	1	$173,800	$173,800.00

GSA Costs	$160,814.44	for 8 wells	
	$173,800.00	for 1100 LF	
Unit Costs	$20,101.81	per well	
	$158.00	per linear foot	
	$102	per linear foot	Injection wells, gravity fed.

Table D-3.28. Control/Instrumentation calibration and maintenance of a GWTU - basis of estimate.

Fiscal Year	1999		Revised 10/26/98
Activity title	Control/Instrumentation calibration and maintenance of a GWTU		
Scope of work	Maintenance of GWTU control system, annual interlock testing		
Assumptions	Unit can be controlled and calibrated for the same cost as in previous years.		
	Cost for SVE = Cost for GAC, and Cost for GBI and BIO = 2 x Cost for GAC		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL500 (Technician)	Per Hour	100	EE Technician - annual interlock inspection, instrument check and calibration, pressure switch tests, and computer hardware and software maintenance.
LLNL300 (Tech Supervisor)	Per Hour	60	EE Senior Engineering Associate - problem diagnosis, software upgrades, maintenance, modifications, transducer replacement and calibration.
LLNL800	Per Hour	40	Plant Shops Electrician - Motor and Electrical Equipment repair; Group Leaders' estimate based on prior years' exerience.
TSP019 (License - Paragon TNT)	Per dollar	1	Control system Paragon software maintenance contract
TSP022 (Misc. Electrical Equipment)	Per dollar	1000	$1000 for replacement fuses, relays, wire, hard drives, etc.; based on prior years' experience.

GWTU-GAC

Resource	Unit Cost	Quantity	Cost
LLNL300	$81.29	60	$4,877
LLNL500	$60.24	100	$6,024
LLNL800	$75.09	40	$3,004
TSP019	$2,456.02	1	$2,456
TSP022	1.09	$1,000.00	$1,090

Costs for Control/Instrumentation calibration and maintenance of a GWTU

$17,451.02	GWTU-GAC
$52,353.06	GWTU-GBI
$34,902.04	GWTU-BIO
$34,902.04	GWTU-GAC-SVE
$69,804.08	GWTU-GBI-SVE

Table D-3.29. Control/Instrumentation calibration and maintenance of a SWAT - basis of estimate.

Fiscal Year	1999 Revised 12/04/98
Activity title	Control/Instrumentation calibration and maintenance of a SWAT
Scope of work	Maintenance of SWAT control system, annual interlock testing
Assumptions	Unit can be controlled and calibrated for the same cost as in previous years. Cost for SVE = Cost for GAC, and Cost for GBI and BIO = 2 x Cost for GAC

Resource	Unit of Application	Quantity	Basis of Estimate
LLNL500 (Technician)	Per Hour	100	EE Technician - annual interlock inspection, instrument check and calibration, pressure switch tests, and computer hardware and software maintenance.
LLNL300 (Tech Supervisor)	Per Hour	200	EE Senior Engineering Associate - problem diagnosis, software upgrades, maintenance, modifications, transducer replacement and calibration.
LLNL800	Per Hour	60	Plant Shops Electrician - Motor and Electrical Equipment repair; Group Leaders' estimate based on prior years' exerience.
TSP022 (Misc. Electrical Equipment)	Per dollar	1000	$1000 for replacement fuses, relays, wire, hard drives, etc.; based on prior years' experience.

Resource	Unit Cost	Quantity	Cost
LLNL300	$81.29	200	$16,258.00
LLNL500	$60.24	100	$6,024.00
LLNL800	$75.09	60	$4,505.40
TSP022	$1.09	1000	$1,090.00

Costs for Control/Instrumentation calibration and maintenance of a SWAT

$27,877.40	SWAT-GAC
$83,632.20	SWAT-GBI
$55,754.80	SWAT-BIO
$55,754.80	SWAT-GIX
$83,632.20	SWAT-BIX

Table D-3.30. Mechanical O&M of a GWTU - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Mechanical O&M of a GWTU		
Scope of work	Operation of GWTU including sampling activities.		
Assumptions	Facility operates 24h/d, 365 d/y.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	40	Facility Engineer - monitor system performance, review data; Group Leader's estimate based on prior years' experience.
LLNL300	Per hour	40	Senior Engineering Associate - reviews treatment processes, and results - Group Leader's estimate based on prior years' experience.
LLNL500 (Technician)	Per hour	500	Facility Operator - replace GAC, dispose waste, download data, maintain logbooks, collect samples.
LLNL800	Per hour	100	Plant technician - site maintenance and general repairs; Group Leaders' estimate based on prior years' exerience.
O&M001 (Electric Power)	Per Kw hr	[Enter Kw hr Estimate]	Pump power Req'ts=q[gal/min]*95[ft](avg lift + head loss)*62.4[#/cu ft]*1/60[min/sec]*1/7.48[cu ft/gal]*1/550[HP/ft#/sec]*0.746[kw/HP] *24*365 **kw-hr/year=157*q[gpm]**
GPR001 (Procard <$5k)	1.09	2000	Sampling equipment, buckets, pipe, valves, etc. = $2000, based on prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	40	$3,663.20
LLNL300	$81.29	40	$3,251.60
LLNL500	$60.24	500	$30,120.00
LLNL800	$75.09	100	$7,509.00
GRP001	1.09	$2,000	$2,180.00
O&M001	$0.10	q*157	

Mech O&M Costs = $ 46,723.80
\+ q*15.7 This is small, neglect this portion!

Table D-3.30. Mechanical O&M of a GWTU - basis of estimate.

Fiscal Year	1999		Revised 12/04/98
Activity title	Mechanical O&M of a GWTU		
Scope of work	Operation of GWTU including sampling activities.		
Assumptions	Facility operates 24h/d, 365 d/y.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	40	Facility Engineer - monitor system performance, review data; Group Leader's estimate based on prior years' experience.
LLNL300	Per hour	40	Senior Engineering Associate - reviews treatment processes, and results - Group Leader's estimate based on prior years' experience.
LLNL500 (Technician)	Per hour	500	Facility Operator - replace GAC, dispose waste, download data, maintain logbooks, collect samples.
LLNL800	Per hour	100	Plant technician - site maintenance and general repairs; Group Leaders' estimate based on prior years' exerience.
O&M001 (Electric Power)	Per Kw hr	[Enter Kw hr Estimate]	Pump power Req'ts=q[gal/min]*95[ft](avg lift + head loss)*62.4[#/cu ft]*1/60[min/sec]*1/7.48[cu ft/gal]*1/550[HP/ft#/sec]*0.746[kw/HP] *24*365 **kw-hr/year=157*q[gpm]**
GPR001 (Procard <$5k)	1.09	2000	Sampling equipment, buckets, pipe, valves, etc. = $2000, based on prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	40	$3,663.20
LLNL300	$81.29	40	$3,251.60
LLNL500	$60.24	500	$30,120.00
LLNL800	$75.09	100	$7,509.00
GRP001	1.09	$2,000	$2,180.00
O&M001	$0.10	q*157	

Mech O&M Costs = $ 46,723.80
\+ q*15.7 This is small, neglect this portion!

Table D-3.31. Mechanical O&M of a SWAT - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Mechanical O&M of a SWAT		
Scope of work	Operation of SWAT including sampling activities.		
Assumptions	Facility operates 24h/d, 365 d/y.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	40	Facility Engineer - monitor system performance, review data; Group Leader's estimate based on prior years' experience.
LLNL300	Per hour	200	Senior Engineering Associate - reviews treatment processes, and results - Group Leader's estimate based on prior years' experience.
LLNL500 (Technician)	Per hour	500	Facility Operator - replace GAC, dispose waste, download data, maintain logbooks, collect samples.
GPR001(Procard,$5k)	Per dollar	2000	Sampling equipment, buckets, pipe, valves, etc. = $2000, based on prior years' experience.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	40	$3,663.20
LLNL300	$81.29	200	$16,258.00
LLNL500	$60.24	500	$30,120.00
GPR001	1.09	2000	$2,180.00

SWAT Mech O&M Costs = $52,221.20

Table D-3.32. GAC disposal - basis of estimate.

Fiscal Year	1999		Revised 10/27/98
Activity title	GAC disposal		
Scope of work	Cost for Replacement of GAC		
Assumptions			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
O&M003 (GAC, Vapor-55gallon/140#)	Each	No. / year	Replacement of 55gal/140# vapor phase GAC canisters.
O&M004 (GAC, Vapor - 2000#)	Each	No. / year	Replacement of 2000# vapor phase GAC canisters.
O&M005 (GAC, Aqueous - 55gal/200#)	Each	No. / year	Replacement of 55gal/200# aqueous phase GAC canisters.
O&M007 (GAC, Aqueous - 1000#)	Each	No. / year	Replacement of 1000# aqueous phase GAC canisters.

Resource	Unit Cost	Quantity	Cost
O&M003	711.36	No. / year	
O&M004	3150.18	No. / year	
O&M005	303.02	No. / year	
O&M007	3891.39	No. / year	

Table D-3.33. Facility Documentation and data collection - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Facility Documentation and data collection		
Scope of work	Self-Monitoring/Compliance/Operational Chemical Sampling		
Assumptions	All labor required for this task is accounted for under Mechical O&M		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
ANL002 (VOC Water Normal)	Per sample	26	Monthly analyses required for influent and effuent, plus 10% QA/QC.
ANL007 (Metals Water Normal)	Per sample	26	Monthly analyses required for influent and effuent, plus 10% QA/QC.
ANL013 (Alpha /Beta /H3 Water Normal)	Per sample	26	Monthly analyses required for influent and effuent, plus 10% QA/QC. See note below for ANL017.
ANL017 (Misc. Analysis)	Per dollar	0	Nitrate, perchlorate, HE and alpha/beta/H3 compound testing required on a location specific basis. For cost estimating purposes, assume 26 ANL013 will cover.
DMU002 (H2O, Air, Soil samples)	Per sample	78	Data management of analytic results and sample documentation; based on 1 DMU002 unit per sample analyzed
DMU003 (Flow measurements)	Per sample	272	Daily facility flow measurements (260 x DMU003) plus monthly extraction well flow measurements (12 x DMU003)

Resource	**Unit Cost**	**Quantity**	**Cost**
ANL002	$60.70	26	$1,578.20
ANL007	$84.34	26	$2,192.84
ANL013	$70.55	26	$1,834.30
DMU002	$75.45	78	$5,885.10
DMU003	$75.45	272	$20,522.40

O&M Cost = $32,012.84

Table D-3.34. Extraction well sampling & analysis - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Extraction well sampling & analysis		
Scope of work	Quarterly Sampling of Extraction Wells		
Assumptions	Labor is accounted for under O&M. Facility Tech collects samples.		
	Only VOC, metals and alpha/beta/H3 analyses required for average cost estimate purposes.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
DMU002 (H20, Air, Soil Samples)	Per sample	12	1 DMU002 required per analysis
ANL002 (VOC Water Normal)	Per sample	4	1 ANL002 required per well per quarter.
ANL007 (Metals Water Normal)	Per sample	4	1 ANL007 required per well per quarter.
ANL013 (Alpha/Beta/H3)	Per sample	4	1 ANL013 required per well per quarter.

Resource	**Unit Cost**	**Quantity**	**Cost**
DMU002	$75.45	12	$905.40
ANL002	$60.70	4	$242.80
ANL007	$84.34	4	$337.36
ANL013	$70.55	4	$282.20

O&M Cost = $1,767.76 per extraction well

Table D-3.35. Manage wellfield flow - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Manage wellfield flow		
Scope of work	Review data and modeling to make decisions regarding pump schemes to maximize contaminant removal.		
Assumptions	Data Analysis and Representation is included elsewhere		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	200	Hydrogeologist - Examine and evaluate data from wellfields & make decisions regarding flow rate changes for individual wells; based on Group Leader's prior years' experience. Use 200 hours per OU per year.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	200	$18,316.00

O&M Cost = $18,316.00

Table D-3.36. Remedial system permit reporting - basis of estimate.

Fiscal Year	1999		Revised 10/16/98
Activity title	Remedial system permit reporting		
Scope of work	Prepare quarterly report on operation of remedial system.		
Assumptions	GSA FY98 expreience applies to other Site 300 locations.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL 200 (Scientist &Engineer)	Per hour	10	Task Leader input and review; based on prior years' experience. (36 hrs)
LLNL500 (Technician)	Per hour	88	Report and figure preparation, data review and evaluation.
DMU005 (Reports, Scheduled & Special)	Report	20	Data preparation for report; based on prior years' experience. (20 DMU005's)
SER003 (TID Jobs)	Dollar	500	Report graphic preparation; based on prior years' experience. ($500)

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL 200	$91.58	10	$915.80
LLNL500	$60.24	88	$5,301.12
DMU005	$75.45	20	$1,509.00
SER003	1.61	$500.00	$805.00

O&M Cost = $8,530.92 per quarter
O&M Cost = $ 34,123.68 annually

Table D-3.37. Excavation and Off-site Disposal of Low Level Radioactive Waste - bases of estimate.

Fiscal Year	1999 Revised 8/11/98		
Activity title	Excavation and Off-site Disposal of Low Level Radioactive Waste		
Scope of work	Planning through disposal, including H&S, post-excavation characterization and site restoration.		
Assumptions	Fixed costs are location specific and detailed in Exhibit A.		
	Variable costs are based on cost/cubic yard of excavated waste. Exhibit A provides additional detail.		
	Low Level Waste disposed at Envirocare, Utah		
Pit 3 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	153,502	Site-specific costs for above-listed activities.

Pit 5 Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	32,019	Assumes that mob/site prep and demob cost included with Pit 3.

B850 Firing Table Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	165,509	Site-specific fixed cost for above-listed activities.
B850 Sand Pile Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	4,002	Assumes that mob/site prep and demob costs included with B850 Firing Table

Table D-3.37. Excavation and Off-site Disposal of Low Level Radioactive Waste - bases of estimate (continued).

B850 Soil Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	14,675	Assumes that mob/site prep and demob costs included with B850 Firing Table

Pit 2 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	153,502	Site-specific fixed cost for above-listed activities.
Pit 8 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	182,853	Site-specific fixed cost for above-listed activities.

Pit 9 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	145,497	Site-specific fixed cost for above-listed activities.

B845 Firing Table Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	13,341	Assumes that mob/site prep and demob costs included with Pit 9.

Table D-3.37. Excavation and Off-site Disposal of Low Level Radioactive Waste - bases of estimate (continued).

B851 Firing Table Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	136,158	Site-specific fixed cost for above-listed activities.

B851 Surface Soil Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	24,014	Assumes that mob/site prep and demob costs included with B851 Surface Soil.

Variable volume excavation costs: H&S/Rad Control, Excavation, Waste Loading & Packing, Site Restoration, Off-site Shipping			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	282	Cost per cubic yard for above-listed activities.

Low Level Waste Disposal.			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	554	Cost per cubic yard for all disposal of Low Level Waste. Based on quote from Envirocare facility in Utah.

Table D-3.38. Characterization of pit contents - basis of estimate.

Fiscal Year	1999 Revised 12/07/98		
Activity title	Characterization of pit contents		
Scope of work	Quantify the contents of pit with use of samples from two, 50 foot long test pits and eight borings		
Assumptions	The pit contents can be quantified with the resources listed below.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL 200 (Scientist &Engineer)	Per hour	200	Task Leader and others write Operation Safety Plan (OSP), have it reviewed and revise document.
LLNL 200 (Scientist &Engineer)	Per hour	80	Task Leader and others write Sampling and Analysis Plan, have it reviewed and revise document.
LLNL500 (Technician)	Per hour	240	Safety technicians implement the OSP, including monitoring, sampling, documenting, etc., during the pit excavation and drilling in the pits.
GPR001 (Procard <$5k)	1.09	5000	Procurement of personal protective equipment, such as Tyvek suits, resperators, canisters, gloves, etc.
		5000	Cost of all analytic tests done for implementation of the OSP.*
		30000	Cost of an operated, articulated front end loader for excavation and backfilling*
LLNL 200 (Scientist &Engineer)	Per hour	200	Geologist to log the test pit, collect samples and document the work.*
LLNL300	Per hour	100	Technician supervisor to oversee the work of subcontractors for excavation.
ADL001	Per mobilization	1	Mobilization of Auger Drill Rig to sample Pit.
ADL002	Per mobilization	1	Demobilization of Auger Drill Rig to sample Pit.
ADL003	Per hour	64	Auger drilling and sampling.*
LLNL 200 (Scientist &Engineer)	Per hour	64	Geologist to log the auger borings, collect samples and document the work.*
LLNL 200 (Scientist &Engineer)	Per hour	280	Task Leader and others write report of findings, have it reviewed and revise document.

ANL005 (Metals, Soils)	Per sample	160	STLC and TTLC Metals analyses of soil samples from test pit and auger borings.**
ANL011 (Alpha/Beta /H3 Soil)	Per sample	80	Tritium analyses of soil samples from test pit and auger borings.**
ANL015	Per sample	80	Nitrate analyses of soil samples from test pit and auger borings.**
ANL008	Per sample	80	Uranium and Thorium isotopes on soil from test pits and auger borings.**
ANL004	Per sample	16	VOC analyses on soil samples from test pit and auger borings.
ANL HE Special	Per sample	16	HE compounds analyses of soil samples from test pits and auger borings.
ANL PCBs	Per sample	16	PCB analyses on soil sample from test pits and auger borings.
DMU002 (H20, Air, Soil Samples)	Per sample	448	1 DMU002 required per analysis.***
DMU004 (New Sampling Location)	Per sample	16	1 DMU004 required per boring and location of vertical line of test pit sampling.
DMUOO5 (Reports, Scheduled & Special)	Per sample	50	Special assistance of data management staff.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL 200	$91.58	824	$75,461.92
LLNL500	$60.24	240	$14,457.60
LLNL300	$81.29	100	$8,129.00
ADL001	$638.28	1	$638.28
ADL002	$319.14	1	$319.14
ADL003	$161.70	64	$10,348.80
ANL004	$56.58	16	$905.28
ANL005	$103.68	160	$16,588.80
ANL008	$150.52	80	$12,041.60
ANL011	$70.55	80	$5,644.00
ANL015	$57.75	80	$4,620.00
ANL Hes	$100.00	16	$1,600.00
ANL PCBs	$1,200.00	16	$19,200.00
DMU002	$75.45	448	$33,801.60
DMU004	$223.98	16	$3,583.68

DMU005	$75.45	50	$3,772.50
GRP001	1.09	5000	$5,450.00
	1	5000	$5,000.00
	1	30000	$30,000.00

Pits 2,3 & 5 Char. Cost $251,562.20

For Pits 8 & 9 *indicates use 0.75, ** indicates use 0.6 and *** indicates reduced calculated value.			
Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL 200	$91.58	758	$69,417.64
LLNL500	$60.24	240	$14,457.60
LLNL300	$81.29	100	$8,129.00
ADL001	$638.28	1	$638.28
ADL002	$319.14	1	$319.14
ADL003	$161.70	38	$6,209.28
ANL004	$56.58	16	$905.28
ANL005	$103.68	96	$9,953.28
ANL008	$150.52	48	$7,224.96
ANL011	$70.55	48	$3,386.40
ANL015	$57.75	48	$2,772.00
ANL Hes	$100.00	16	$1,600.00
ANL PCBs	$1,200.00	16	$19,200.00
DMU002	$75.45	288	$21,729.60
DMU004	$223.98	16	$3,583.68
DMU005	$75.45	50	$3,772.50
GRP001	1.09	5000	$5,450.00
	1	3750	$3,750.00
	1	22500	$22,500.00

Pits 8 & 9 Char. Cost $204,998.64

Table D-3.39. Construct Iron filings trenches near B850 - basis of estimate.

Fiscal Year	1999		Revised 12/17/98
Activity title	Construct Iron filings trenches near B850		
Scope of work	Construct Iron filings trenches and backfill with iron.		
Assumptions	Experience of local contractor on similar construction applies.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
			Sheet piling area for **B850 trench** is 2*150ft*35ft=10,500sq ft.
		$110,000	Unit cost of extracted piling is $10/sq ft - (Dave Graff of Stoer & Graff of Antioch, CA) for a total of $105,000 USE $110,000
		$5,000	Clear and grub for access
			Excavate trench (10*150*30ft) say 2000 cu yd.
		$60,000	Five man crew @ $75/hr for 4 weeks
		$6,000	Equipment rental- $300/day for 4 weeks
		$21,000	Off haul 700 cu yds of spoils @ $30
			Backfill costs
		$904,000	Cost of iron filings in the bottom 10 feet, 670 cu yd @ $1350/cu yd ($400/ton and 250#/cu ft)
		$30,000	Five man crew @ $75/hr for 2 weeks
		$3,000	Equipment rental- $300/day for 2 weeks
		$1,139,000	Subtotal
		$227,800	Plant Engineering Project Management @ 20%
		$1,366,800	Total

Excavation costs in future years

	Excavate B850 trench (10*150*30ft) say 2000 cu yd.
$60,000	Five man crew @ $75/hr for 4 weeks
$6,000	Equipment rental- $300/day for 4 weeks
$380,800	Off haul and dispose 700 cu yds of iron and soil spoils @ $544
$446,800	Subtotal
$1,813,600	Total cost at years 10 and 20

$1,113,550	Present Worth of Total Cost Expended at year 10
$683,727	Present Worth of Total Cost Expended at year 20
$3,164,078	Total present worth of trenches
$1,797,278	Present Worth of Replacement Walls at Years 10 and 20.

Table D-3.40. Construct Iron filings trenches near Pit 5 - basis of estimate.

Fiscal Year	1999		Revised 12/17/98
Activity title	Construct Iron filings trenches near Pit 5.		
Scope of work	Construct Iron filings trenches and backfill with iron.		
Assumptions	Experience of local contractor on similar construction applies.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
			Sheet piling area for **Pit 5 trench** is 2*250ft*35ft=17,500sq ft.
		$175,000	Unit cost of extracted piling is $10/sq ft - (Dave Graff of Stoer & Graff of Antioch, CA) for a total of $175,000
		$5,000	Clear and grub for access
			Excavate trench (10*250*30ft) say 2780 cu yd. Use 3000 cu yd.
		$90,000	Five man crew @ $75/hr for 6 weeks
		$9,000	Equipment rental- $300/day for 6 weeks
		$60,000	Off haul 2000 cu yds of spoils @ $30
			Backfill costs
		$1,350,000	Cost of iron filings in the bottom 10 feet, 1000 cu yd @ $1350/cu yd ($400/ton and 250#/cu ft)
		$45,000	Five man crew @ $75/hr for 3 weeks
		$4,500	Equipment rental- $300/day for 3 weeks
		$1,738,500	Subtotal
		$347,700	Plant Engineering Project Management @ 20%
		$2,086,200	Total

Excavation costs in future years

	Excavate Pit 5 trench (10*250*30ft) say 2780 cu yd. Use 3000 cu yd.
$90,000	Five man crew @ $75/hr for 6 weeks
$9,000	Equipment rental- $300/day for 6 weeks
$544,000	Off haul 1000 cu yds of spoils @ $544
$643,000	Subtotal
$2,729,200	Total cost at years 10 and 20
$1,675,729	Present Worth of Total Cost Expended at year 10

$1,028,908 Present Worth of Total Cost Expended at year 20
$4,790,837 Total present worth of trenches
$2,704,637 Present Worth of Replacement Walls at Years 10 and 20.

Table D-3.41. Capping - bases of estimate.

Fiscal Year	1999		Revised 8/12/99
Activity title	Capping		
Scope of work	Design, construct, and maintain a multi-layer landfill cap and associated surface drainage.		
Assumptions	Costs based on similar design and actual costs on other recently constructed LLNL capping projects (Pit 6 and 829 Burn Pit caps apply). Costs are gnerally linearly scaled based anticipated cap surface area.		
Pit 2 capping			
Phase	**Cost element**	**Unit cost**	**Comments**
Design	Title I/II Design	$150,000	$70,000 for LLNL Plant Engineering design document preparation assuming similar design to Pits 6 and 829 Burn Pit caps. $80,000 for LLNL environmental reviews, project oversight, and regulatory interfaces and comments.
	Third party design review	$22,500	15% of Title I/II design. Allotted for outside review and consulting.
	Post-closure plan	$50,000	Based on actual costs for Pit 6 post-closure plan
Construction	Construction contractor	$6.99	Cost per square foot of cap. Cap and surface drainage structures. Based on actual costs for Pit 6. Assumes local borrow source for native material layers, use of synthetic liner/bentonite layer and drainage netting.
	CQA contractor	$0.91	Based on extroplated costs incurred on Pit 6 and 829 Burn Pit caps.
	Title III design support	$10,000	Fixed cost for LLNL Plant Engineering design support during construction
	Construction project management	$0.91	LLNL construction oversight. Equal to CQA.
Maintenance	Annual maintenance	$10,000	Rough estimate for annual labor and material needed to maintain cap. Allows for 125 hrs @ $60/hr + $2,500 misc. materials.

Table D-3.41. Capping - bases of estimate (cont.).

Pit 8 capping			
Phase	**Cost element**	**Unit cost**	**Comments**
Design	Title I/II Design	$70,000	$70,000 for LLNL Plant Engineering design document preparation assuming similar design to Pits 6 and 829 Burn Pit caps. Assume that $80,000 for LLNL environmental reviews, project oversight, and regulatory interfaces and comments is covered on Pit 2 capping.
	Third party design review	$10,500	15% of Title I/II design. Allotted for outside review and consulting.
	Post-closure plan	$50,000	Based on actual costs for Pit 6 post-closure plan
Construction	Construction contractor	$6.65	Cost per square foot of cap. Cap and surface drainage structures. Based on actual costs for Pit 6. Assumes local borrow source for native material layers, use of synthetic liner/bentonite layer and drainage netting.
	CQA contractor	$0.85	Based on extroplated costs incurred on Pit 6 and 829 Burn Pit caps.
	Title III design support	$10,000	Fixed cost for LLNL Plant Engineering design support during construction
	Construction project management	$0.85	LLNL construction oversight. Equal to CQA.
Maintenance	Annual maintenance	$10,000	Rough estimate for annual labor and material needed to maintain cap. Allows for 125 hrs @ $60/hr + $2,500 misc. materials.

Table D-3.41. Capping - bases of estimate (cont.).

Pit 9 capping			
Phase	**Cost element**	**Unit cost**	**Comments**
Design	Title I/II Design	$70,000	$70,000 for LLNL Plant Engineering design document preparation assuming similar design to Pits 6 and 829 Burn Pit caps. Assume that $80,000 for LLNL environmental reviews, project oversight, and regulatory interfaces and comments is covered on Pit 2 capping.
	Third party design review	$10,500	15% of Title I/II design. Allotted for outside review and consulting.
	Post-closure plan	$50,000	Based on actual costs for Pit 6 post-closure plan
Construction	Construction contractor	$15.46	Cost per square foot of cap. Cap and surface drainage structures. Based on actual costs for Pit 6. Assumes local borrow source for native material layers, use of synthetic liner/bentonite layer and drainage netting.
	CQA contractor	$2.50	Based on extroplated costs incurred on Pit 6 and 829 Burn Pit caps. Cost loses economy of scale due to relatively small size (Pit 9 cap would be about 20% size of Pit 2 or Pit 8 cap).
	Title III design support	$10,000	Fixed cost for LLNL Plant Engineering design support during construction
	Construction project management	$2.50	LLNL construction oversight. Equal to CQA.
Maintenance	Annual maintenance	$10,000	Rough estimate for annual labor and material needed to maintain cap. Allows for 125 hrs @ $60/hr + $2,500 misc. materials.

Table D-3.42. Prepare Building Occupancy and Land Use Restriction Plan - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Prepare Building Occupancy and Land Use Restriction Plan		
Scope of work	Coordinate devolopment of building occupancy and land use restrictions with LLNL site management for areas of potential elevated risk.		
Assumptions	Plans to be implemented as part of buiilding or facility location managers' routine safety responsibilities.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	40	Task Leader's coordination with other LLNL operational divisions, meetings and liason with regulatory agenices.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	40	$3,663.20
	Total =	$3,663.20	

Table D-3.43. Review Building Occupancy and Land Use Restriction Plan - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Review Building Occupancy and Land Use Restriction Plan		
Scope of work	Review and update plan based on changes in risk and hazard assessment.		
Assumptions	Performed as needed, but assumed to be done every five years.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	40	Task Leader's review of risk assessment data and incorporation of necessary changes to plan. Coordination with other LLNL divisions and liason with regulatory agencies.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	40	$3,663.20
	Total =	$3,663.20	

Table D-3.44. Install warning signs - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Install warning signs		
Scope of work	Install signs indicating site-specific land use and/or building occupancy restrictions as described in the restrcition plan.		
Assumptions	Assume two signs necessary per location. Signs to be permanent and maintenance costs are not significant.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist and Engineer)	Per hour	1	Task leader coordination with LLNL management and skilled labor.
LLNL800 (Skilled Crafts)	Per hour	3	Sign preparation and installation. 2 hr for sign preparation. 1 hr to intall signs.
TSP023 (Misc. Mech Equipment)	Per dollars	200	Sign materials.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	1	$91.58
LLNL800	$75.09	3	$225.27
TSP023	1.09	$200.00	$218.00
	Total =	$534.85	

Table D-3.45. Prepare Risk and Hazard Monitoring Plan - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Prepare Risk and Hazard Monitoring Plan		
Scope of work	Prepare plan for conducting site-specific sampling and/or ecological surveys.		
Assumptions	Plans assumed to be in place for 30 years, but will not need to be implemented after risks are reduces to acceptable levels..		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	40	Task Leader's review and coordination with other LLNL operational divisions, meetings and liason with regulatory agenices.
LLNL200 (Scientist/Engineer)	Per hour	80	Staff scientist preparation of plan.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	120	$10,989.60
	Total =	$10,989.60	

Table D-3.46. Sample ambient air (VOCs) - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Sample ambient air sampling (VOCs)		
Scope of work	Vapor sample collection & analysis once a year.		
Assumptions	Average analysis cost is represented by one ANL0018 per sampling event. Two samples collected per event.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	1	Task Leader's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per location per year.
LLNL500(Technician)	Per hour	3	Sampling technician's task coordination and plan preparation and time to sample; based on Group Leader's prior years' experience. Use 1 hour per location per event to sample and 2 hour/year to prepare plan.
LLNL200 (Scientist/Engineer)	Per hour	2	Hydrogeologist's's review of sampling plan and laboratory data, and calculation of modeled flux concentration; based on Group Leader's prior years' experience. Use 2 hours per well per year.
ANL0018 (VOC Vapor Normal)	Per Sample	2.2	VOC vapor analysis with normal turnaround + 10% QA/QC samples.
DMU002 (H2O, Air, Soil Samples)	Per Sample Analysis	2.2	Data management of analytical data; based on 1 DMU002 unit per analysis.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	3	$274.74
LLNL500	$60.24	3	$180.72
ANL0018	$376.05	2.2	$827.31
DMU002	$75.45	2.2	$165.99
	Total =	$1,448.76	

Table D-3.47. Sample ambient air (tritium) - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Sample ambient air sampling (tritium)		
Scope of work	Vapor sample collection & analysis once a year.		
Assumptions	Average analysis cost is represented by one ANL0019 per sampling event. Two samples collected per event.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	1	Task Leader's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per location per year.
LLNL500(Technician)	Per hour	3	Sampling technician's task coordination and plan preparation and time to sample; based on Group Leader's prior years' experience. Use 1 hour per location per event to sample and 2 hour/year to prepare plan.
LLNL200 (Scientist/Engineer)	Per hour	2	Hydrogeologist's's review of sampling plan and laboratory data, and calculation of modeled flux concentration; based on Group Leader's prior years' experience. Use 2 hours per well per year.
ANL0019 (tritium Vapor Normal)	Per Sample	2.2	Tritium vapor analysis with normal turnaround performed by on-sit lab+ 10% QA/QC samples. Detection limit of 50 pCi/L.
DMU002 (H2O, Air, Soil Samples)	Per Sample Analysis	2.2	Data management of analytical data; based on 1 DMU002 unit per analysis.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	3	$274.74
LLNL500	$60.24	3	$180.72
ANL0019	$981.00	2.2	$2,158.20
DMU002	$75.45	2.2	$165.99
	Total =	$2,779.65	

Table D-3.48. Sample surface soil (PCBs) - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Soil sampling and potential exposure concentration calculations for PCBs		
Scope of work	Surface soil sample collection & analysis once a year.		
	Samples to be collected from top six inches of soil in vicnity of potential risk.		
Assumptions	Average analysis cost is represented by one ANL0020 per sampling event.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	1	Task Leader's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 1 hour per location per year.
LLNL500(Technician)	Per hour	2	Sampling technician's task coordination and plan preparation and time to sample; based on Group Leader's prior years' experience. Use 1 hour per location per event to sample and 1 hour/year to prepare plan.
LLNL200 (Scientist/Engineer)	Per hour	1	Hydrogeologist's's review of sampling plan and laboratory data, and calculation of potential exposure concentrations; based on Group Leader's prior years' experience. Use 1 hour per event.
ANL0020 (PCB Soil Normal)	Per Sample	1.1	PCB soil analysis with normal turnaround + 10% QA/QC samples.
DMU002 (H2O, Air, Soil Samples)	Per Sample Analysis	1.1	Data management of analytical data; based on 1 DMU002 unit per analysis.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	2	$183.16
LLNL500	$60.24	2	$120.48
ANL0020	$81.75	1.1	$89.93
DMU002	$75.45	1.1	$83.00
	Total =	$476.56	

Table D-3.49. Sample surface soil (dioxins/furans) - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Sample surface soil (dioxins/furans)		
Scope of work	Surface soil sample collection & analysis once a year. Done in conjunction with other surface soil sampling.		
	Samples to be collected from top six inches of soil in vicnity of potential risk.		
Assumptions	Average analysis cost is represented by one ANL0021 per sampling event.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	0.5	Task Leader's review of sampling plan and laboratory data; based on Group Leader's prior years' experience. Use 0.5 hour per location per year.
LLNL500(Technician)	Per hour	0.5	Sampling technician's time to sample. Task coordination and plan preparation is containted in other surface soil sampling done in conjunction. Use .5 hour per location per event to sample.
LLNL200 (Scientist/Engineer)	Per hour	0.5	Hydrogeologist's's review of sampling plan and laboratory data, and calculation of potential exposure concentrations; based on Group Leader's prior years' experience. Use 0.5 hour per event.
ANL0021 (dioxins/furans Soil Normal)	Per Sample	1.1	Dioxin/furan soil analysis with normal turnaround + 10% QA/QC samples. Detection limits of 10-25 ppt.
DMU002 (H2O, Air, Soil Samples)	Per Sample Analysis	1.1	Data management of analytical data; based on 1 DMU002 unit per analysis.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	1	$91.58
LLNL500	$60.24	0.5	$30.12
ANL0021	$1,580.50	1.1	$1,738.55
DMU002	$75.45	1.1	$83.00
	Total =	$1,943.25	

Table D-3.50. Conduct wildlife survey - basis of estimate.

Fiscal Year	1999 Revised 06/10/99		
Activity title	Conduct wildife survey		
Scope of work	Conduct field survey to identify if the San Joaquin kit fox of other fossorial vertebrate species of special concern have established residence in areas of potential elevated risk. Prepare written letter report showing area of survey and findings.		
Assumptions	Areas can be surveyed in one and a half days. Cost represents one survey and report. These would be done semi-annually. Does not include costs of response actions if species are found in residence.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	2	Task Leader's review of reported findings and liason with regulatory agencies.
LLNL200 (Scientist/Engineer)	Per hour	16	Wildlife biologist field survey (12 hrs) and letter report and map preparation (4 hrs).

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	18	$1,648.44
	Total =	$1,648.44	

Table D-3.51. Prepare Risk and Hazard and RAO Compliance Report - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Prepare Risk and Hazard and RAO Compliance Report		
Scope of work	Review data collected from one round of risk and hazard assessment sampling and update exposure calculations to re-evaulate exposure risks and hazards. Review of collected data with respect to remedial action objecftives (RAOs) and comparative analysis.		
Assumptions	Review includes up to three exposure pathways and two contaminant categories		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	20	Task Leader's coordination with risk assessor and review of reported findings.
LLNL200 (Scientist/Engineer)	Per hour	40	Risk assessor calculations, preparation of data tables, and report preparation.
LLNL200 (Scientist/Engineer)	Per hour	16	Review of data with respect to RAOs. Preparation of comparative analysis table.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	76	$6,960.08
	Total =	$6,960.08	

Table D-3.52. Prepare Occupational Safety Procedures - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Prepare Occupational Safety Procedures		
Scope of work	Prepare risk and hazard-specific OSP to be incorporated into site safety plans.		
Assumptions	Asssumes that periodic review and update costs are minor and incorporated into overall site safety reviews.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist/Engineer)	Per hour	2	Task Leader's coordination.
LLNL200 (Scientist/Engineer)	Per hour	24	OSP preparation and other divisions review.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	26	$2,381.08
	Total =	$2,381.08	

Table D-3.53. Install soil vapor monitor point - basis of estimate.

Fiscal Year	1999		Revised 06/10/99
Activity title	Install soil vapor monitor point		
Scope of work	Clear location, core asphalt or concrete as necessary, hand auger to dpeth of 3 ft, install soil vapor monitor point and well head vault		
Assumptions	1.5 day required for installation of entire monitor point including well head vault. Depth of bore hole is 3 feet and can be hand-augered. Well vault is standard Christy-vault installed flush with ground surface.		
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
LLNL200 (Scientist and Engineer)	Per hour	0.5	Drilling Coordinator - coordination for well design and construction; based on prior years' experience. Assume multiple locations done at one time.
LLNL800 (Skilled Crafts)	Per dollars	2	Asphalt/concrete coring. Assume minimum of 2 hr charge.
LLNL500 (Technician)	Per hour	12	Technician - install monitor point and wellhead; based on prior years' experience.
LLNL200 (Scientist and Engineer)	Per hour	3	Hydrogeologist-1 hrs to inspect monitor point completion and document installation, 2 hours to review and prepare information for data base/logs; based on prior experience.
TSP023 (Misc. Mech Equipment)	Per dollars	200	Well vault ($100), sampling valve and related fittings ($50), PVC piping and other monitor point completion supplies ($50)
LLNL800 (Skilled Crafts)	Per hour	2	Survey crew to survey well location and elevation; based on assumption that several wells surveyed at same time and prior years' experience. (2 hrs)
DMU002	Per location	1	Data management for location data.

Resource	**Unit Cost**	**Quantity**	**Cost**
LLNL200	$91.58	3.5	$320.53
LLNL500	$60.20	14	$842.80
LLNL800	$75.09	4	$300.36
DMU002	$75.45	1	$75.45
TSP023	1.09	$200.00	$218.00
	Total =	$1,757.14	

Table D-3.54. Excavation and On-site Disposal of Low Level Radioactive Waste - bases of estimate.

Fiscal Year	1999 Revised 9/15/98
Activity title	Excavation and On-site Disposal of Low Level Radioactive Waste
Scope of work	Planning through disposal, including H&S, on-site landfill construction, post-excavation characterization and site restoration.
Assumptions	Fixed costs are location specific and detailed in Exhibits A and B. Variable costs are based on cost/cubic yard of excavated waste. Exhibits A and B provide additional detail.

Pit 3 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	153,502	Site-specific fixed cost for above-listed activities (see Exhibit A).

Pit 5 Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	32,019	Assumes that mob/site prep and demob cost included with Pit 3 (see Exhibit A)

B850 Firing Table Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	165,509	Site-specific fixed cost for above-listed activities (see Exhibit A).

B850 Sand Pile Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	4,002	Assumes that mob/site prep and demob costs included with B850 Firing Table (see Exhibit A).

Table D-3.54. Excavation and On-site Disposal of Low Level Radioactive Waste - bases of estimate (continued).

B850 Soil Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	14,675	Assumes that mob/site prep and demob costs included with B850 Firing Table (see Exhibit A).

Pit 2 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	153,502	Site-specific fixed cost for above-listed activities (see Exhibit A).

Pit 8 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	182,853	Site-specific fixed cost for above-listed activities (see Exhibit A).

Table D-3.54. Pit 9 Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob - basis of estimate.			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	145,497	Site-specific fixed cost for above-listed activities (see Exhibit A).

B845 Firing Table Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	13,341	Assumes that mob/site prep and demob costs included with Pit 9 (see Exhibit A).

Table D-3.54. Excavation and On-site Disposal of Low Level Radioactive Waste - bases of estimate (continued).

B851 Firing Table Fixed excavation costs: Mob/Site Prep, Excavation Confirmation Sampling, and DeMob			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	136,158	Site-specific fixed cost for above-listed activities (see Exhibit A).

B851 Surface Soil Fixed excavation costs: Excavation Confirmation Sampling			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	24,014	Assumes that mob/site prep and demob costs included with B851 Surface Soil (see Exhibit A).

Variable volume excavation costs: H&S/Rad Control, Excavation, Waste Loading & Packing, Site Restoration			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	48	Cost per cubic yard for above-listed activities (see Exhibit A).

Pit 3 Fixed on-site disposal costs: Disposal facility siting, Design			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Dollars	3,609,864	Cost for above-listed activites (see Exhibit B). This is a one-time cost and may be applied to other locations if waste form Pit 3 is not disposed on-site.

Variable volume on-site disposal costs: On-site landfill liner construction, Hauling and on-site disposal, On-stie Landfill cap construction, Ground water monitoring system installation			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	62	Cost per cubic yard for above-listed activities (see Exhibit B).

Table D-3.54. Excavation and On-site Disposal of Low Level Radioactive Waste - bases of estimate (continued).

Pit 3 Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	107,188	Cost of above-listed activity (see Exhibit B). Includes costs for upgradient and cross-gradient monitoring and $82,800 for reporting which is not repeated for other locations. If Pit 3 waste is not disposed on-site, these costs would need to be applied to another location.

Pit 5 Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	9,880	Cost of above-listed activity (see Exhibit B)

Building 850 Firing Table Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	3,328	Cost of above-listed activity (see Exhibit B)

Pit 2 Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	9,153	Cost of above-listed activity (see Exhibit B)

Table D-3.54. Excavation and On-site Disposal of Low Level Radioactive Waste - bases of estimate (continued).

Pit 8 Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	9,037	Cost of above-listed activity (see Exhibit B)

Pit 9 Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	3,717	Cost of above-listed activity (see Exhibit B)

Building 845 Firing Table Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	3,231	Cost of above-listed activity (see Exhibit B)

Building 851 Firing Table Post-closure monitoring and maintenance (annual cost)			
Resource	**Unit of Application**	**Quantity**	**Basis of Estimate**
GPR005	Per dollar	3,085	Cost of above-listed activity (see Exhibit B)